# IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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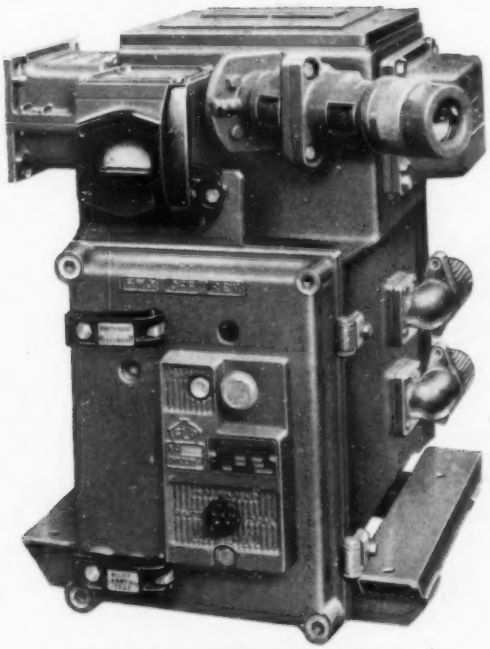
## the Belmos SGU.30

## 30 ampere gate-end box



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3 Intrinsically safe EARTH LEAKAGE LOCKOUT circuit

4 Intrinsically safe remote control circuit complying with NCB SPECIFICATION P 130/1955.

5 STALLED-CURRENT-BREAKING isolating switch.

6 Remote control and sequence interlocking facilities.

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* Fully described in leaflet F311.

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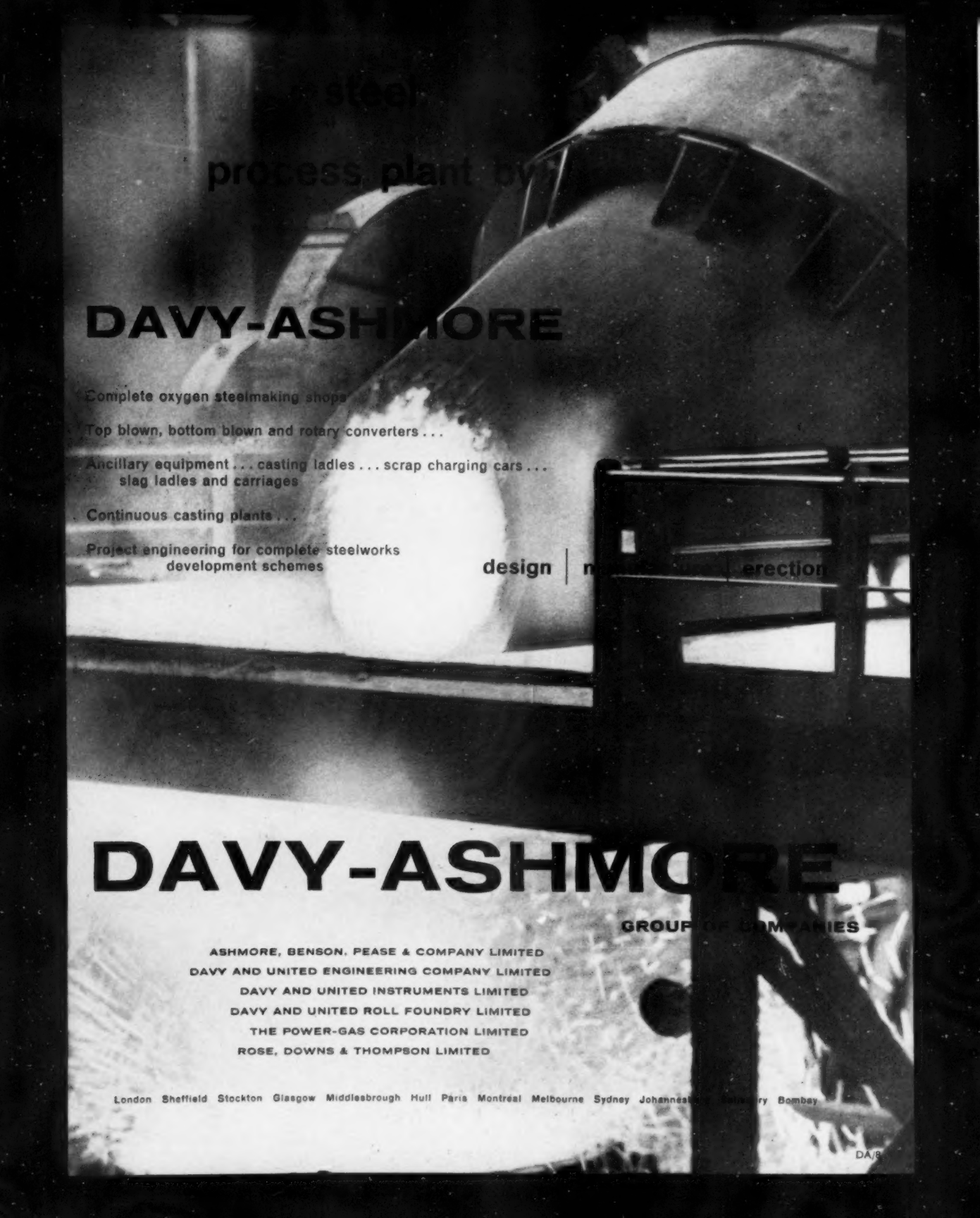
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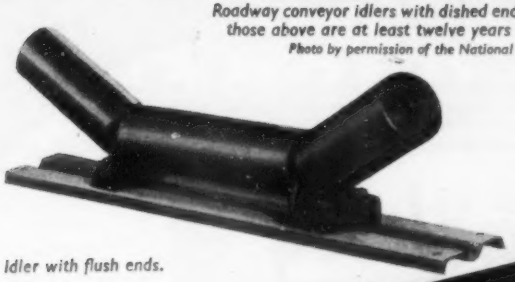
# SEALED FOR LONG LIFE



*Roadway conveyor idlers with dished ends like those above are at least twelve years old.*
*Photo by permission of the National Coal Board*

*Idler with flush ends.*

*The idlers in the underground photograph have dished ends. Lots like them are at work. But M&C changed to flush ends in 1946, so the dished ends are at least twelve years old. Old? They don't act old, for they run like the best. Obsolete? Newer M&C idlers have still better labyrinth seals, but the older ones spin at a touch too. How do they do it? Above all, thanks to their seals. Whether the seals are recharged occasionally or left severely alone, they keep the bearings safe, sealed not just for life but for* **long** *life.*

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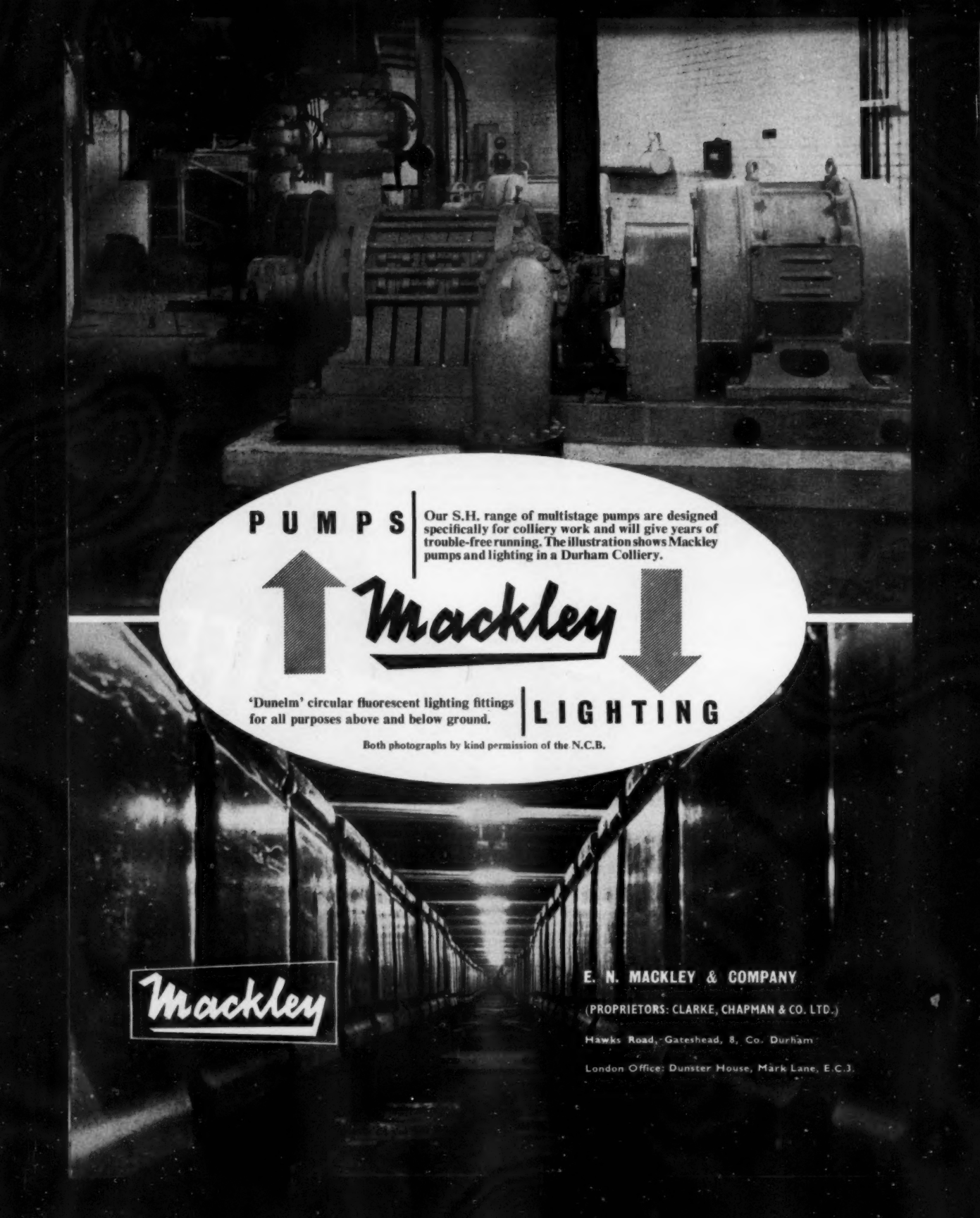
PUMPS
Our S.H. range of multistage pumps are designed specifically for colliery work and will give years of trouble-free running. The illustration shows Mackley pumps and lighting in a Durham Colliery.
Mackley
'Dunelm' circular fluorescent lighting fittings for all purposes above and below ground.
LIGHTING
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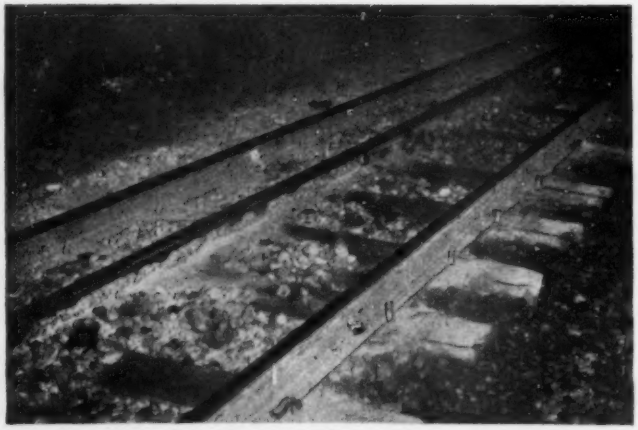

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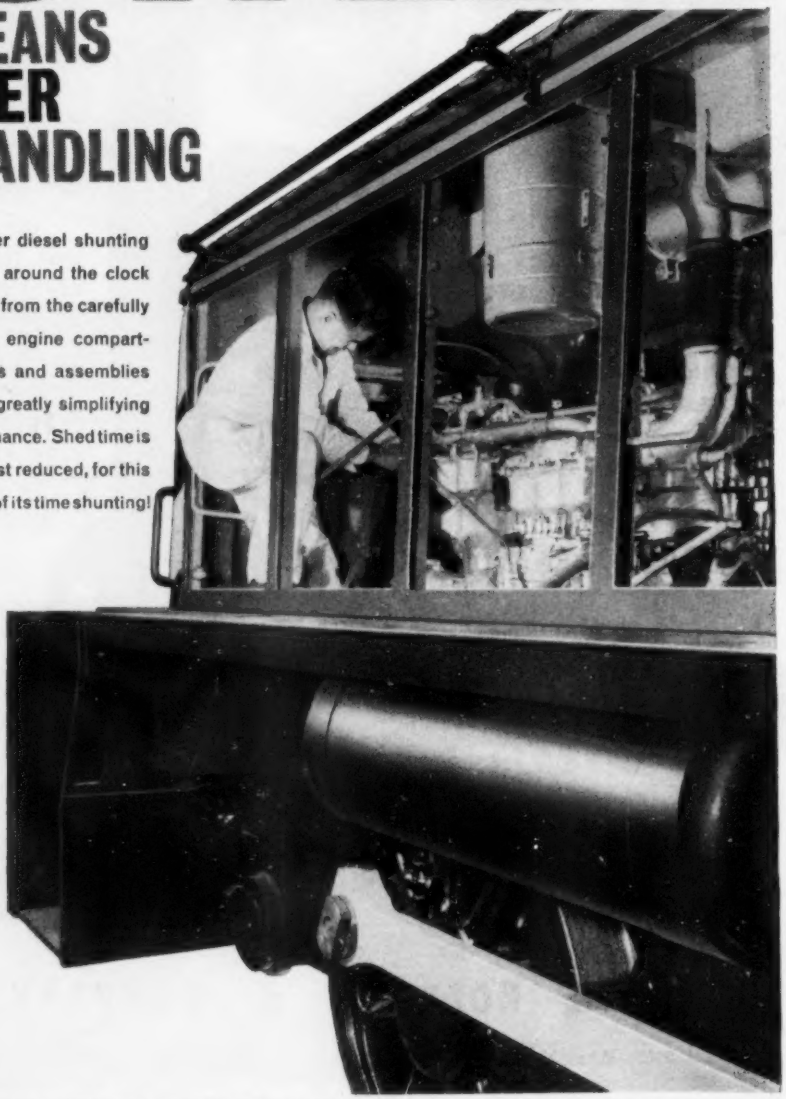

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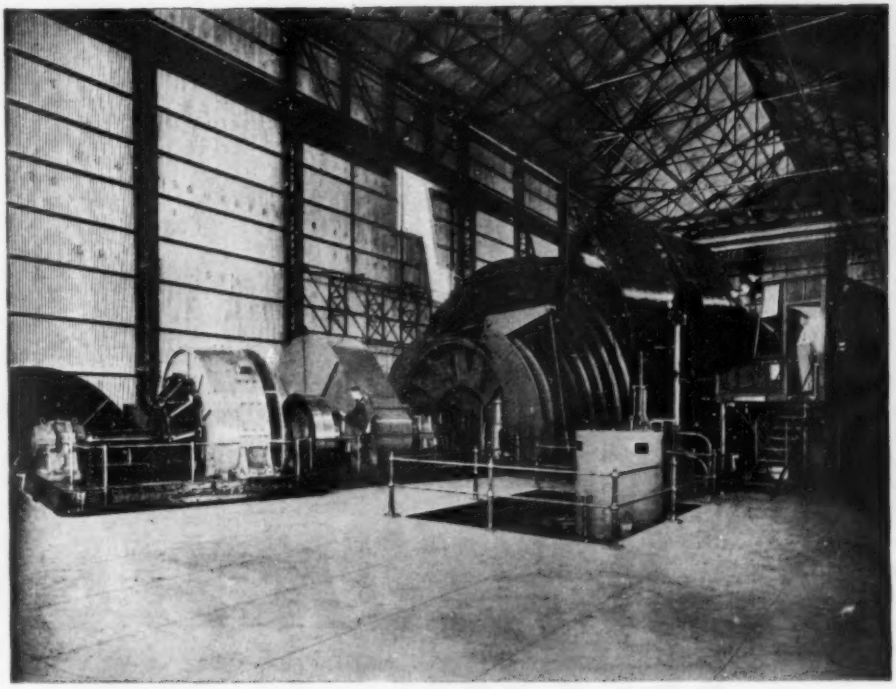

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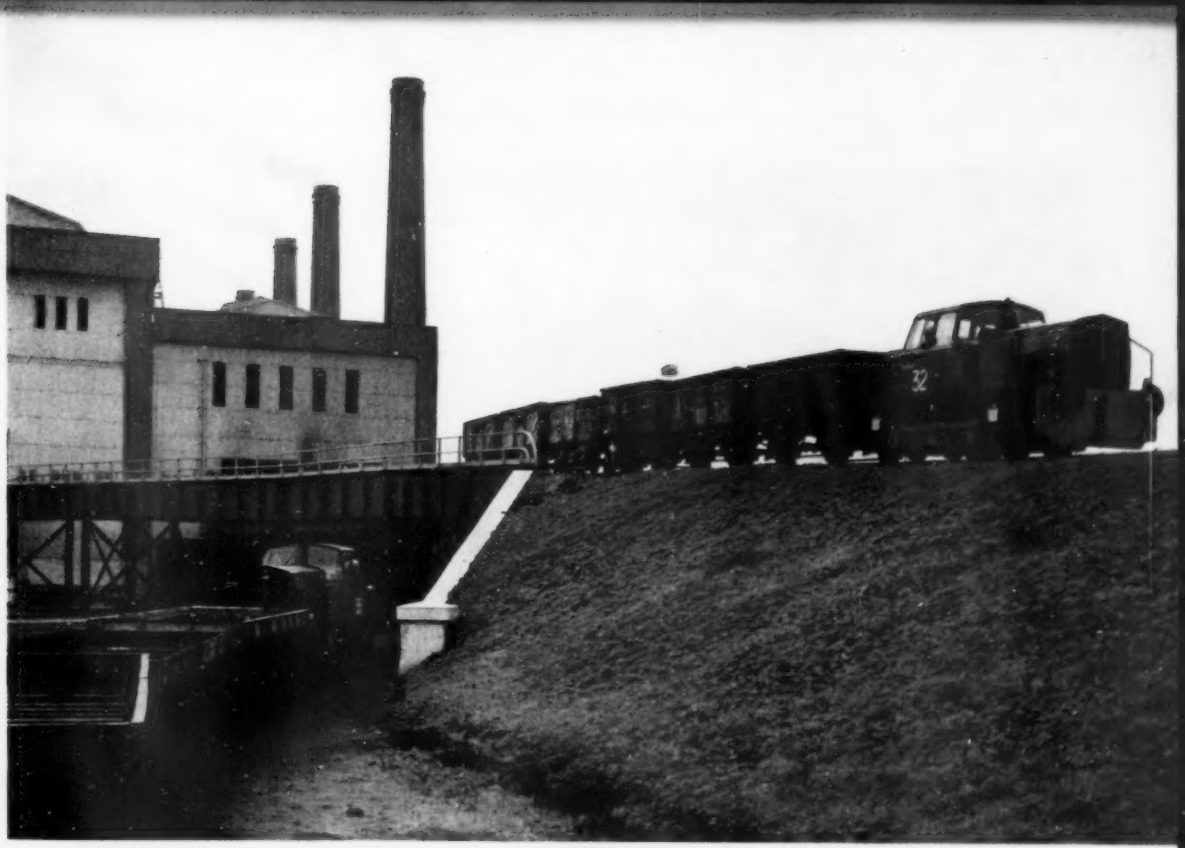

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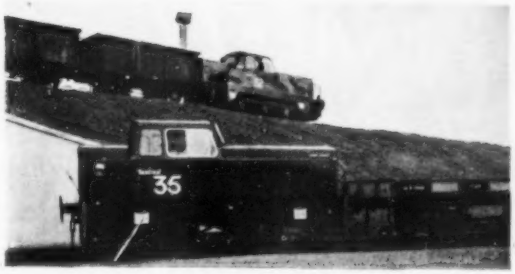
Visibility

Control...



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Sentinel 0-6-0 and 0-4-0 Industrial Locomotives are powered by Rolls Royce diesels with Rolls Royce Hydrokinetic Torque Convertors (Twin Disc license) giving continuously variable transmission ratio up to 5·2:1. Maximum tractive effort 0-6-0, 29,300 lbs, giving haulage capacity of 445 tons @ 10 m.p.h. on level & 176 tons @ 3 m.p.h. on 1 in 30 grade. Maximum tractive effort 0-4-0, 22,600 lbs, haulage capacity 378 tons @ 10 m.p.h. on level & 133 tons @ 3 m.p.h. on 1 in 30 grade. Brakes and control gear power operated, dual control. Completely unrestricted vision in all directions making for complete safety of operation.

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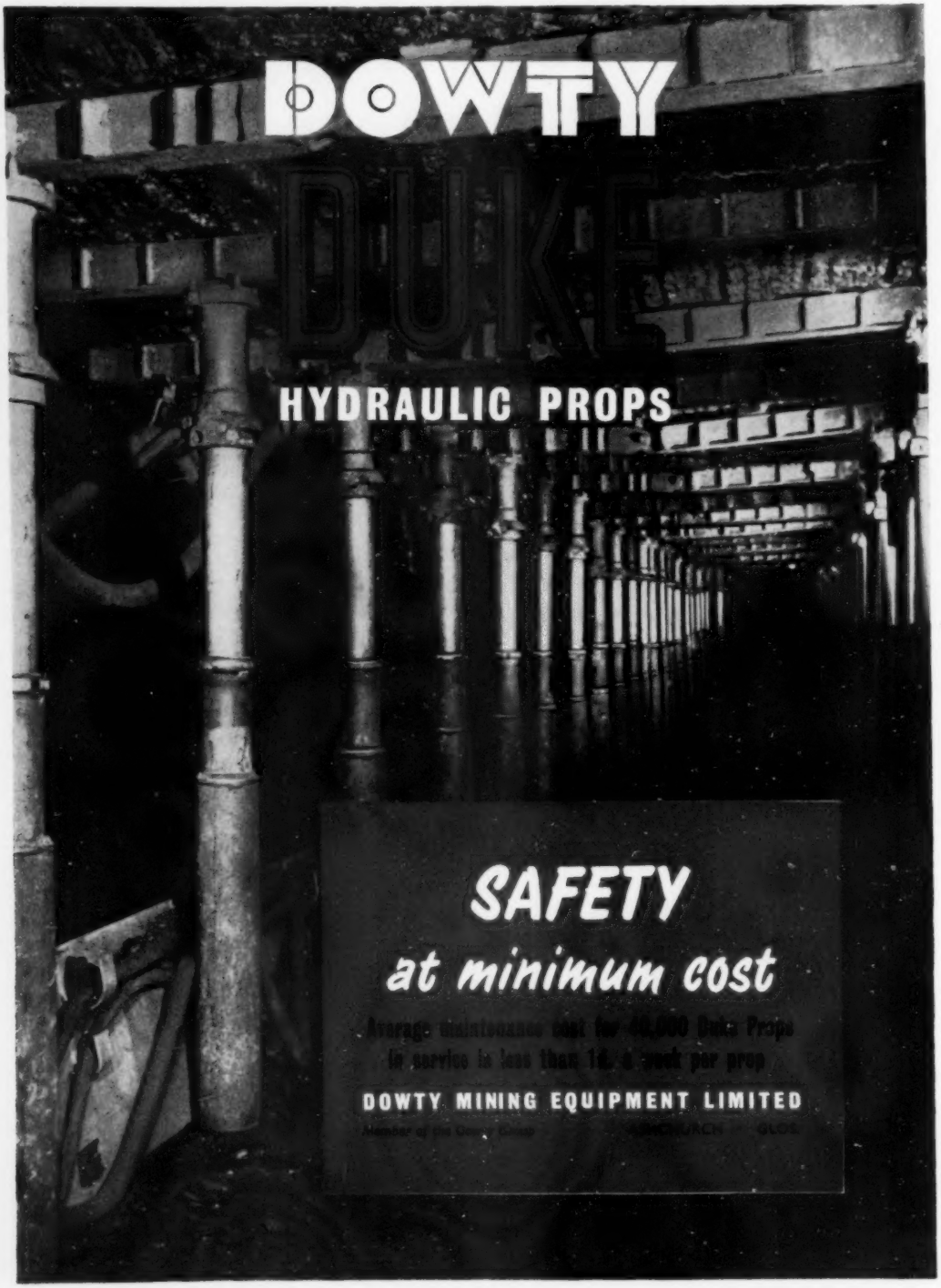
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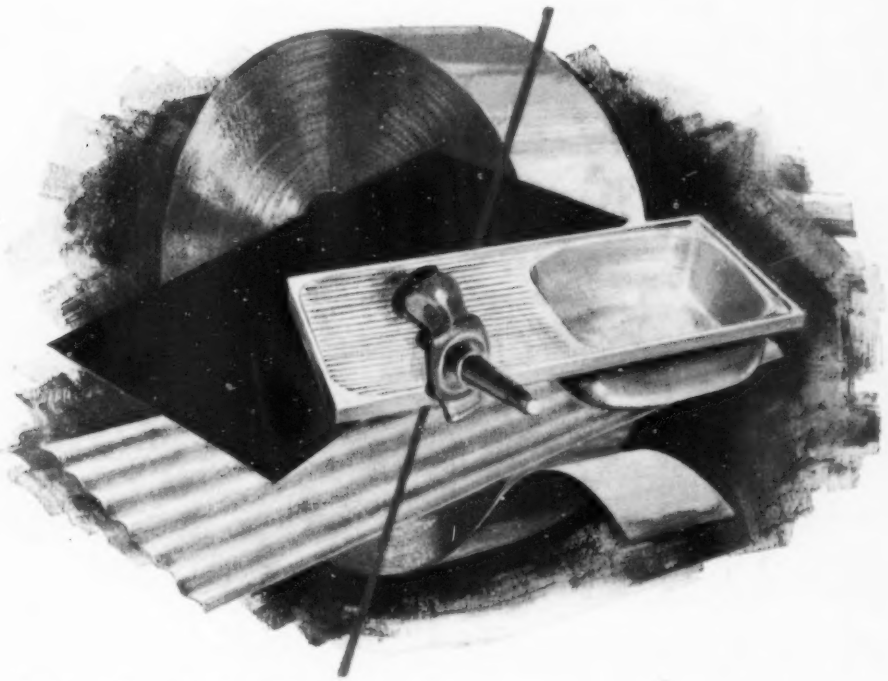

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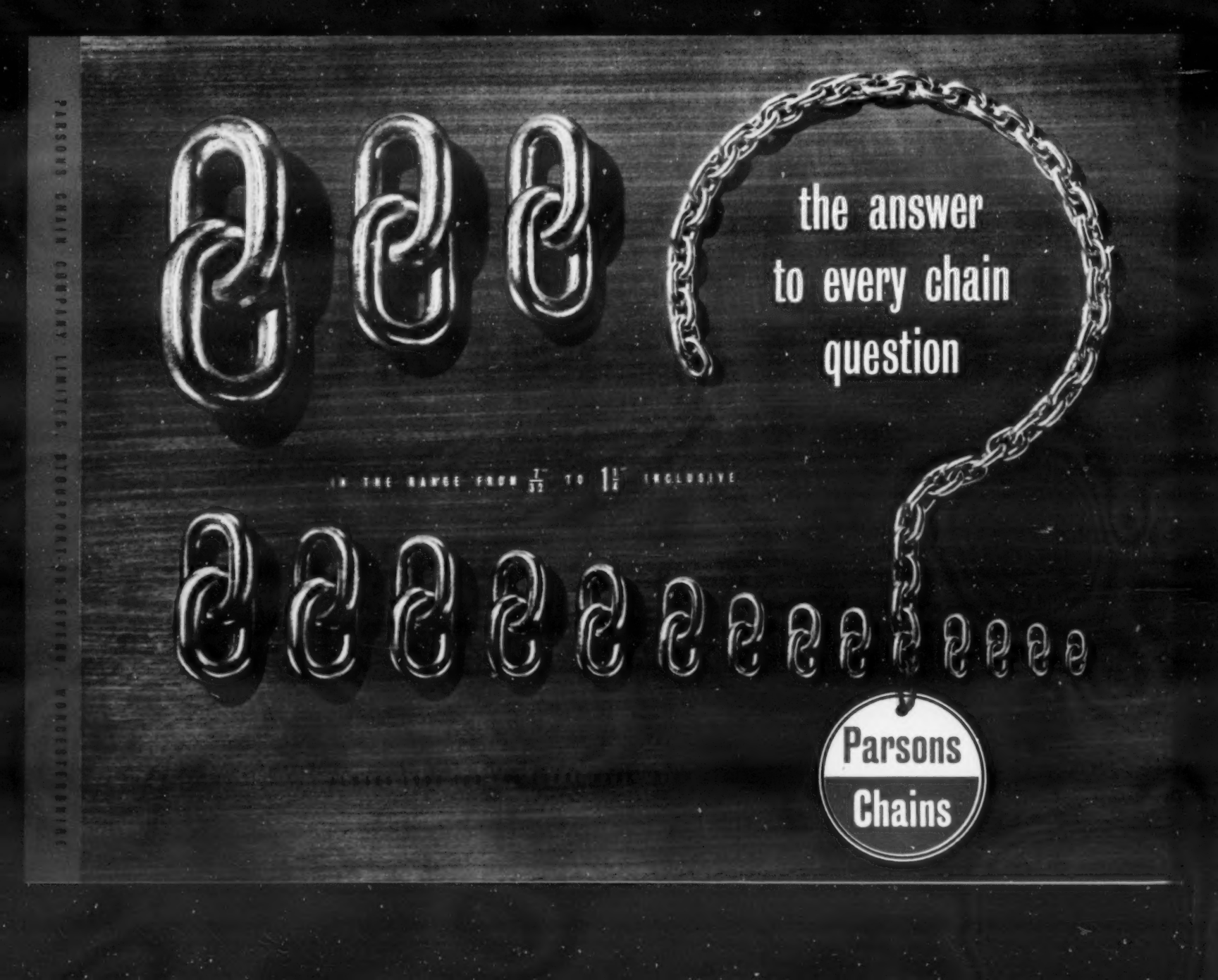
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During its campaign the furnace produced 920,700 tons of iron involving a throughput of 2,450,000 tons of burden and 750,000 tons of coke. Throughout the entire campaign the burden consisted of 100% sinter. The tonnage handled by this furnace on such a practice is a record for the Appleby-Frodingham organisation.
AND THIS!
RECORD BROKEN
United Steel's "Queen Victoria" blast furnace at Appleby-Frodingham has beaten the record set up only a month ago by the same company's "Queen Bess" furnace—please see our release of 10th June. For the first time a British blast furnace operating with 100% sinter burden has produced over 1m. tons of iron. The campaign is continuing and the stack lining is in excellent condition. As in the "Queen Bess", the stack is lined with M.R.2 super-duty firebricks manufactured by Morgan Refractories Ltd., a subsidiary of The Morgan Crucible Company Ltd.
The campaign has now lasted 112 weeks. During this period the "Queen Victoria" has been charged with 2,570,000 tons of sinter containing 36% iron, 40,000 tons of scrap and 820,000 tons of coke. 26 cwt. of slag is tapped for each ton of metal produced, so that the liquid output of the furnace so far this campaign is 2¼m. tons.
Issued by The Morgan Crucible Co. Ltd, Public Relations Dept. (Battersea 8822) on behalf of Morgan Refractories Ltd.
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Thanks are due to the N.C.B. for their enthusiastic co-operation in this outstanding achievement.

*Photo by courtesy of N.C.B.*

COMPLETE GAS PRODUCER PLANTS BY

*Simon-Carves Ltd*

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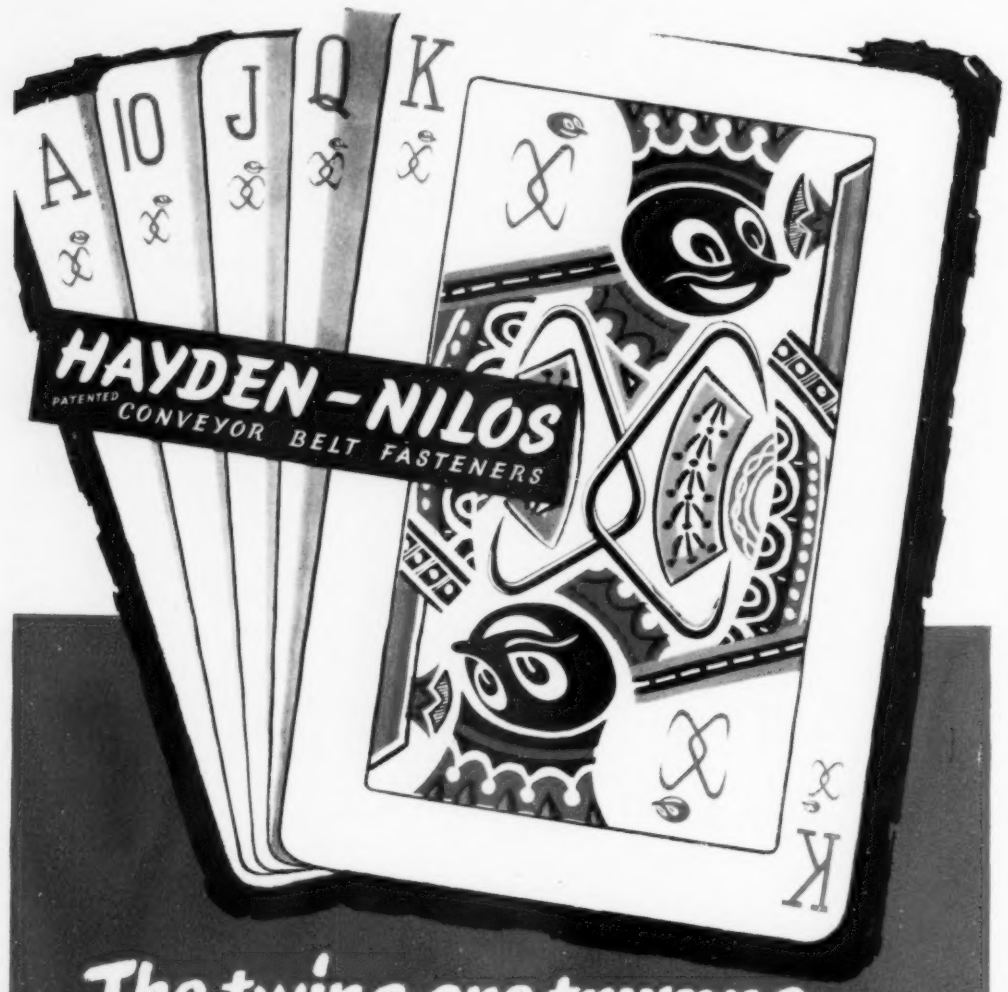


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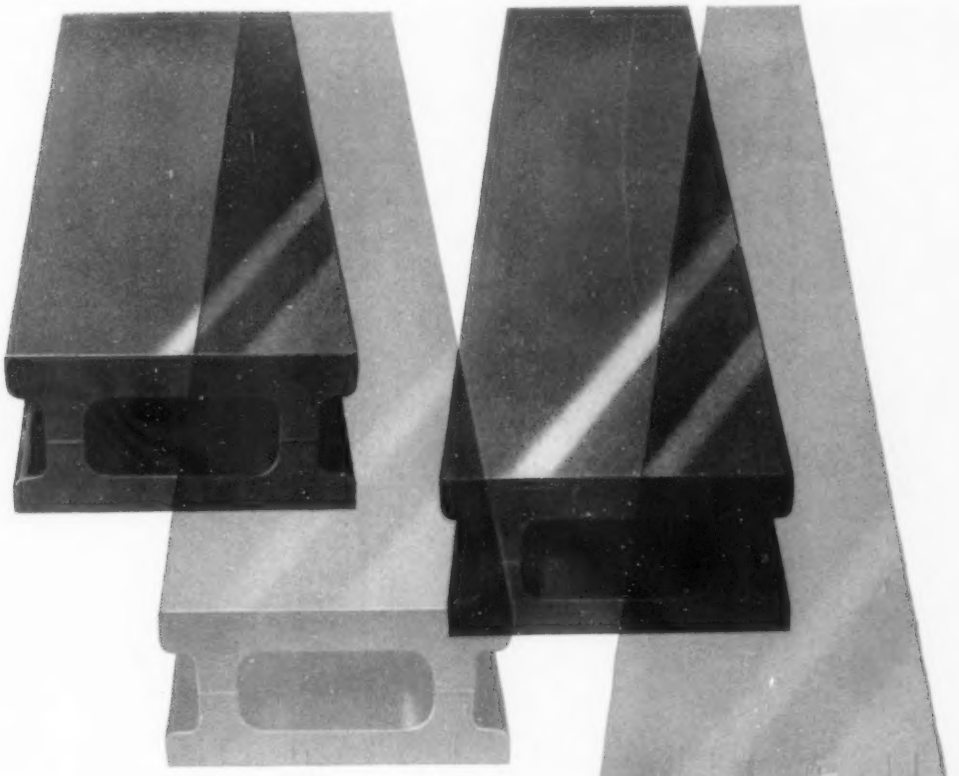

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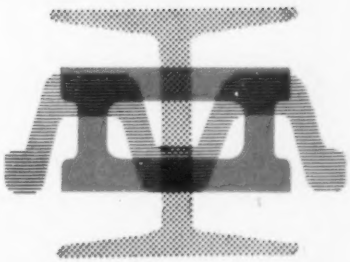

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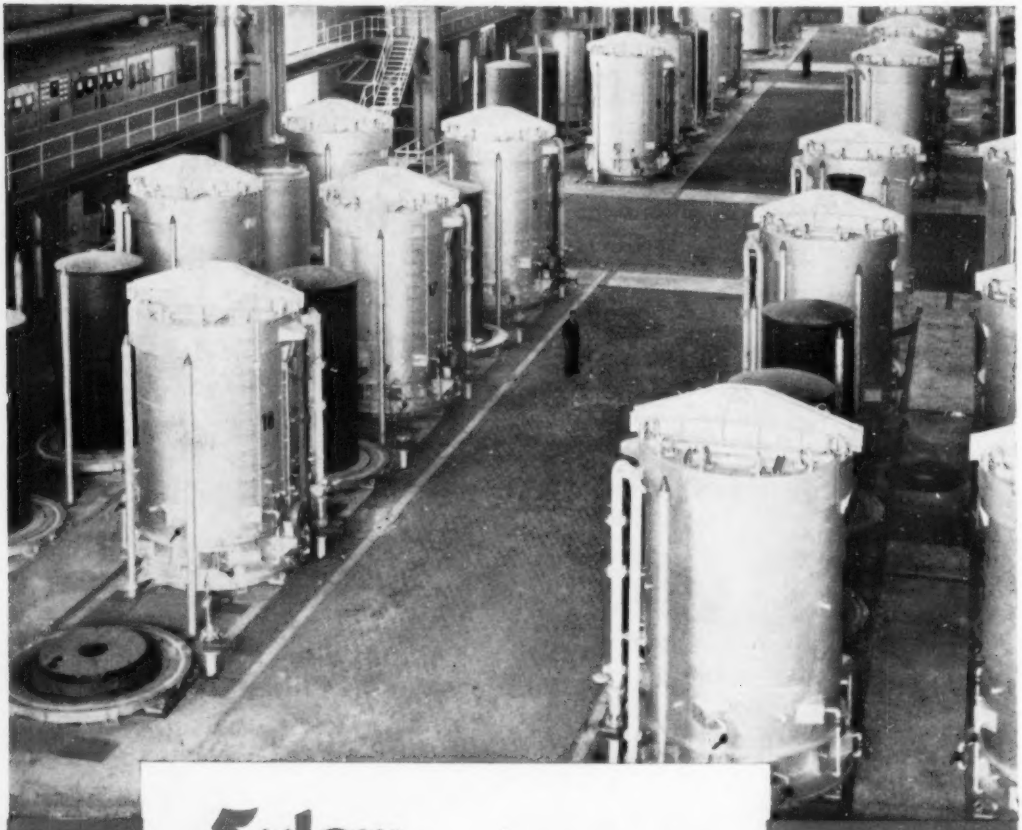

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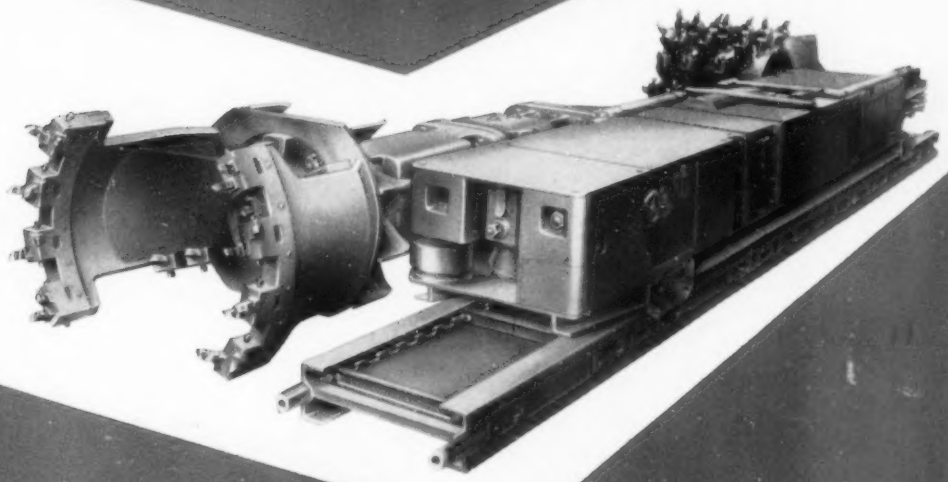
P.5072

# NOW—the B.J-D Trepan Shearer goes into production



BJD

AFTER prolonged tests, the B.J-D Trepan Shearer is coming into production. There is going to be a big demand for this machine, so it will be well to get your order in early.

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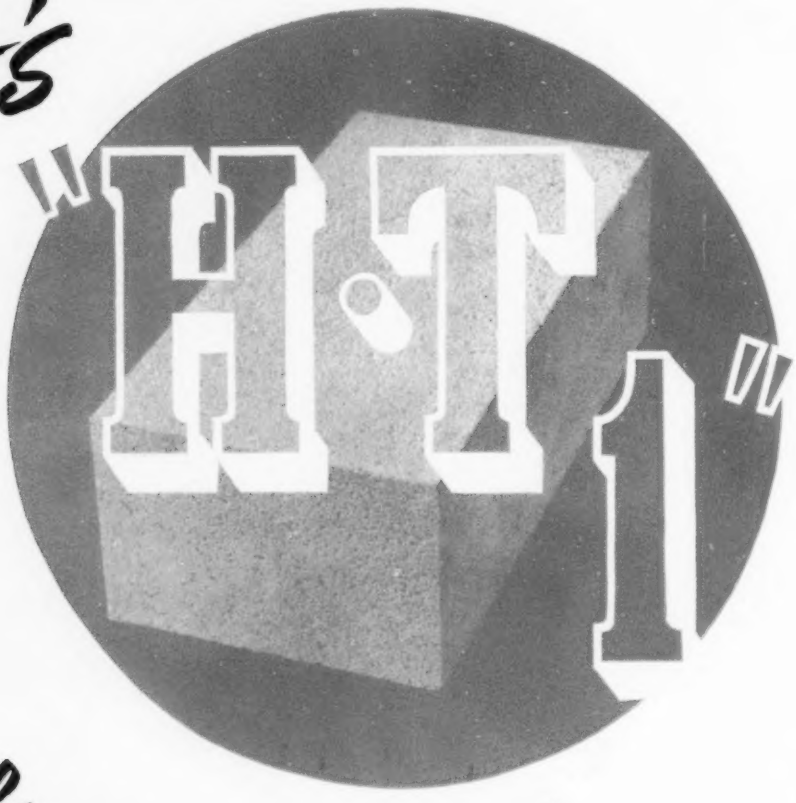
*It's*

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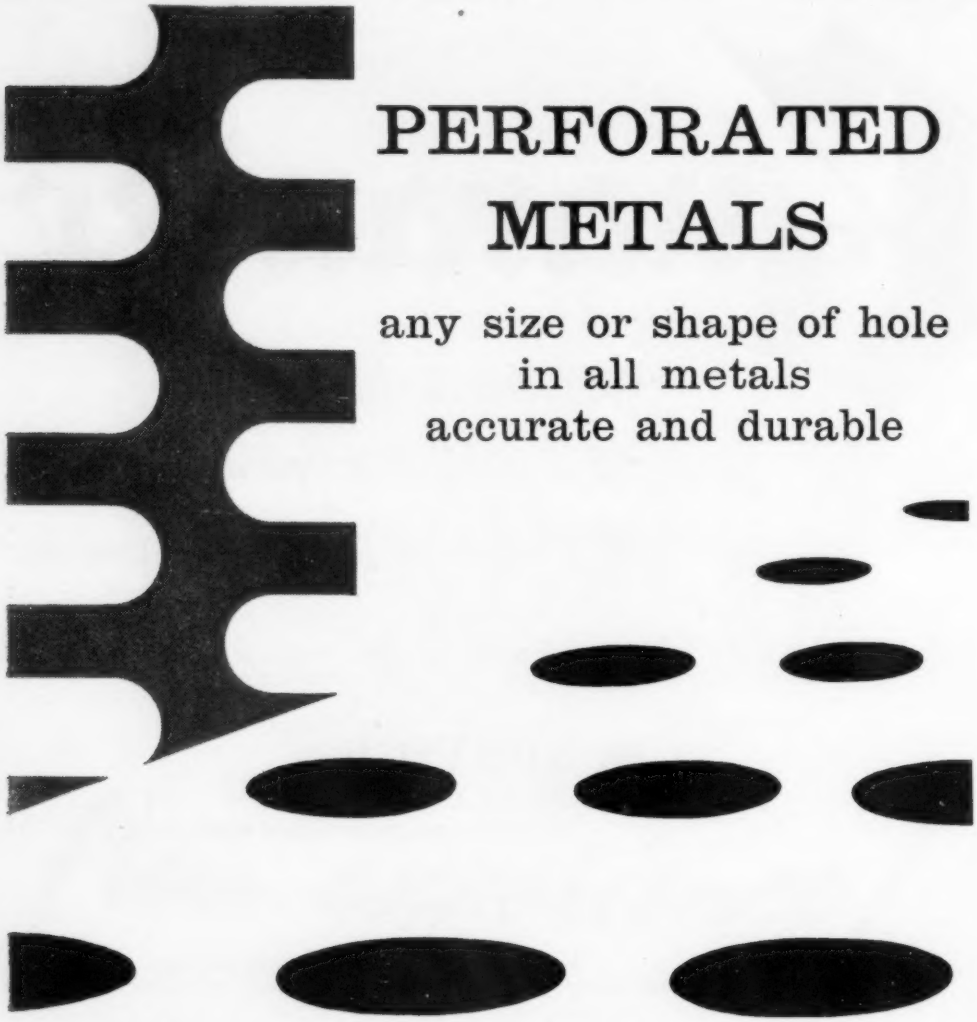

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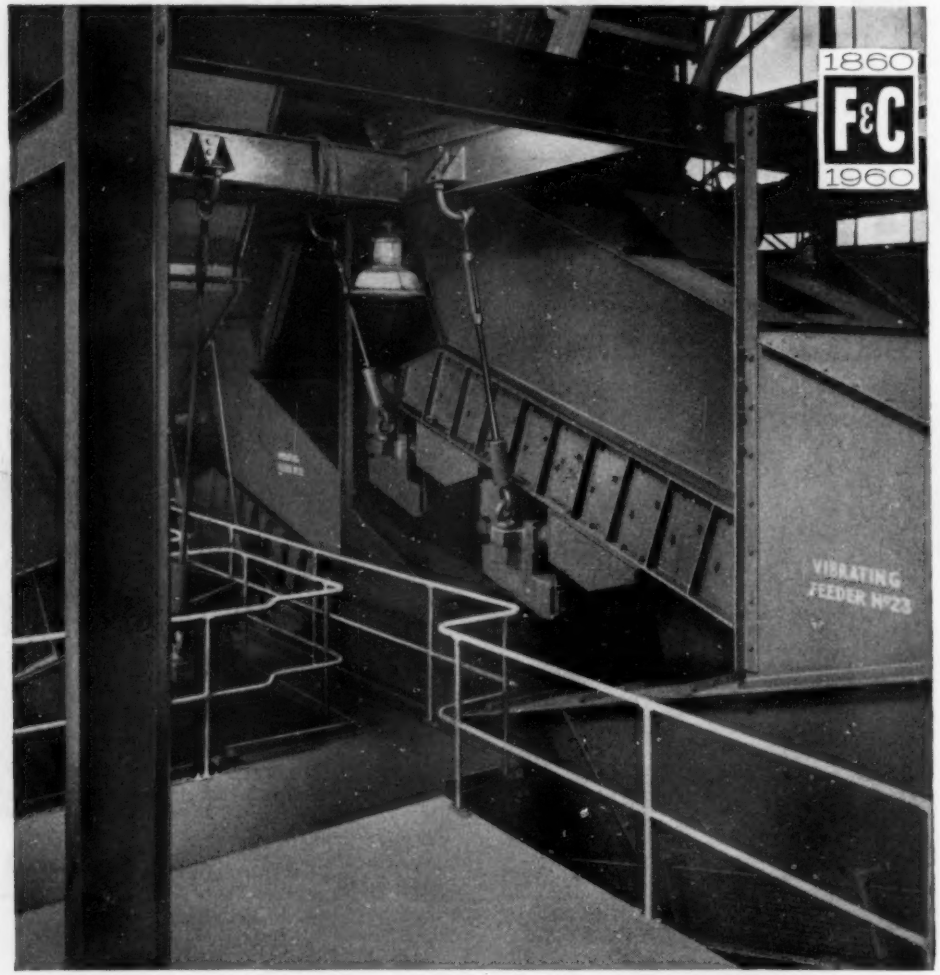


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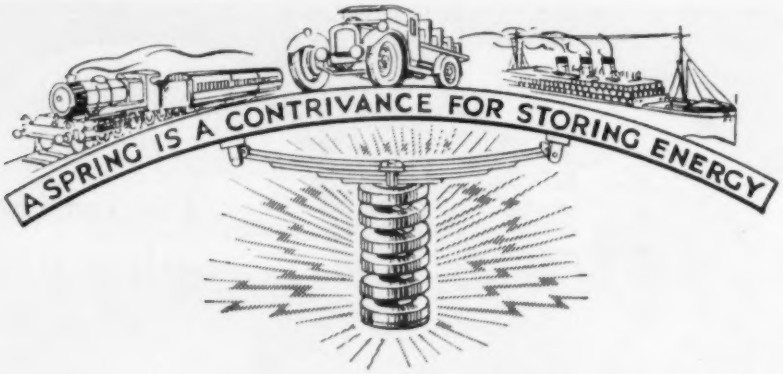


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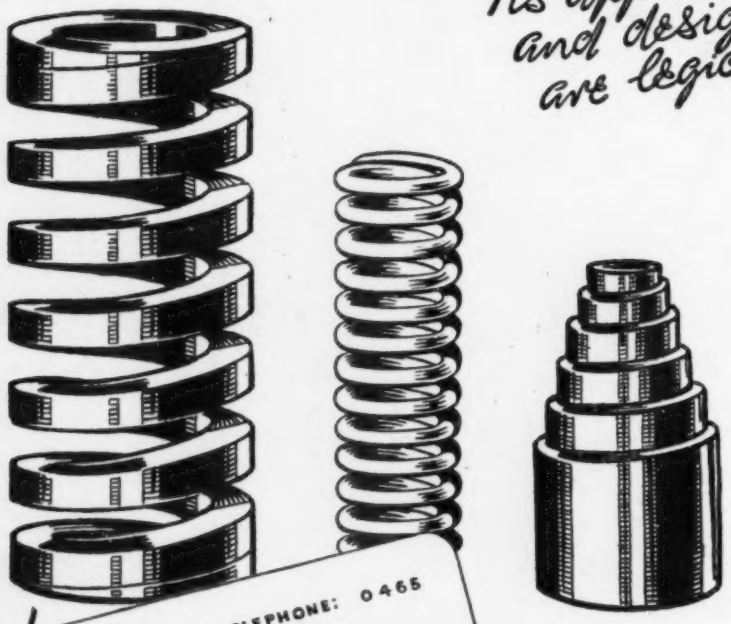

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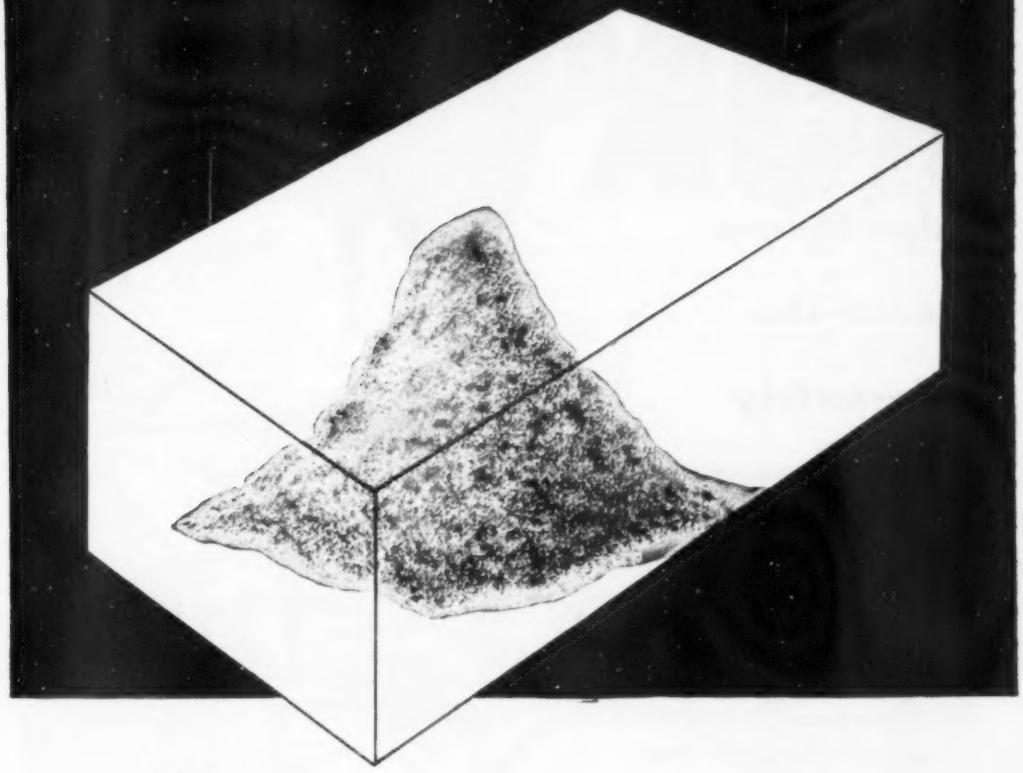

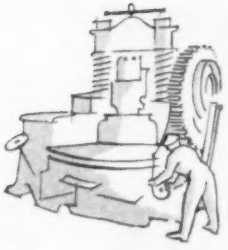

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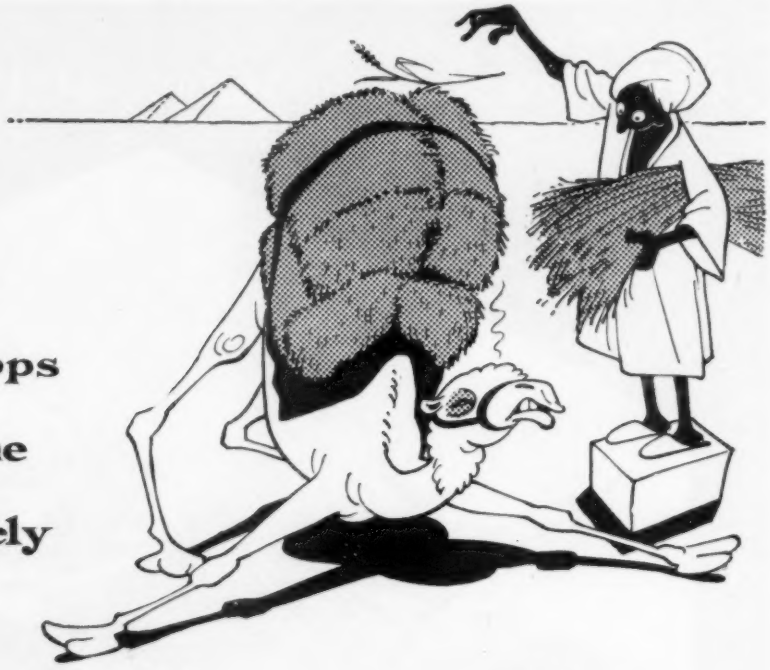

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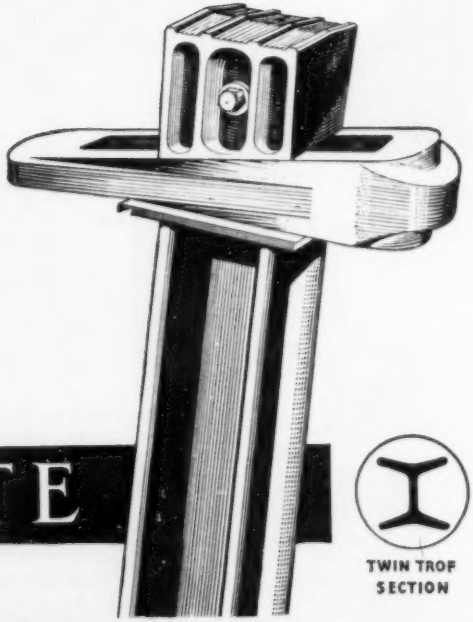

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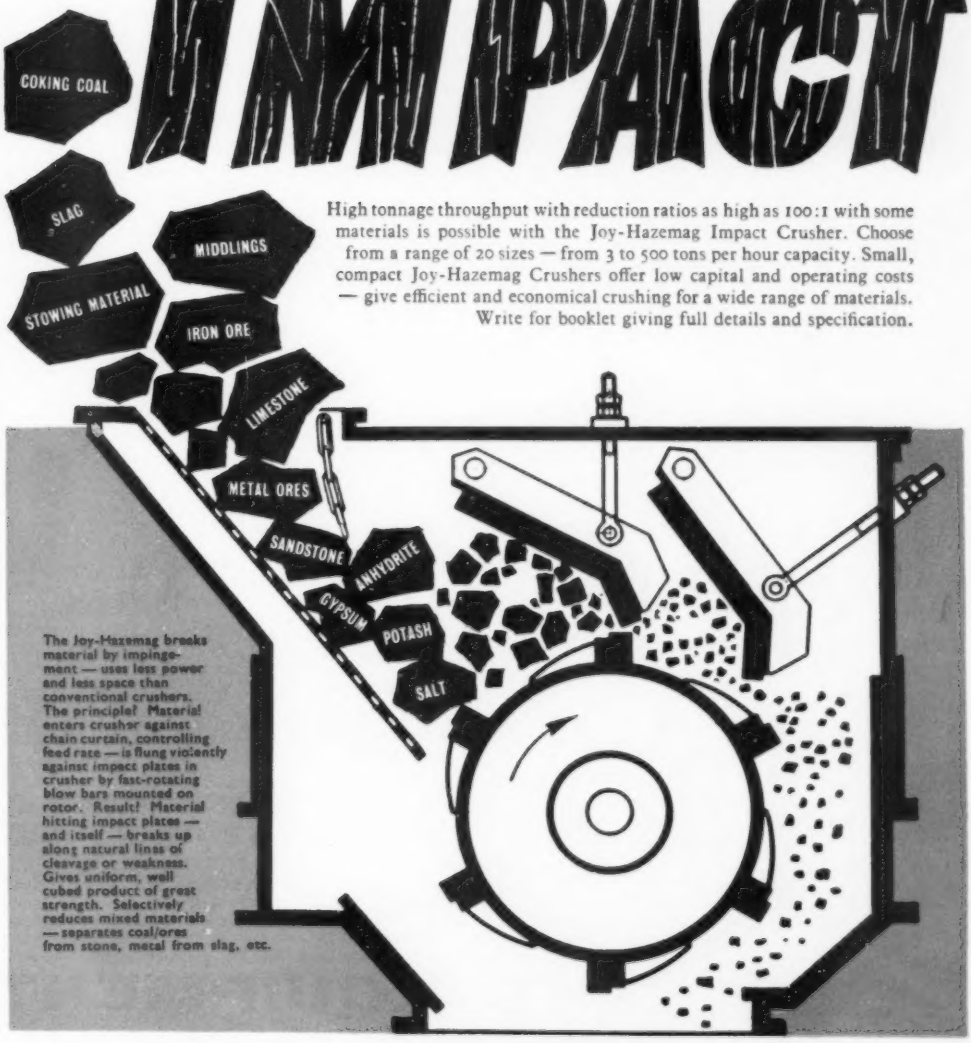


The Joy-Hazemag breaks material by impingement — uses less power and less space than conventional crushers. The principle? Material enters crusher against chain curtain, controlling feed rate — is flung violently against impact plates in crusher by fast-rotating blow bars mounted on rotor. Result! Material hitting impact plates — and itself — breaks up along natural lines of cleavage or weakness. Gives uniform, well cubed product of great strength. Selectively reduces mixed materials — separates coal/ores from stone, metal from slag, etc.

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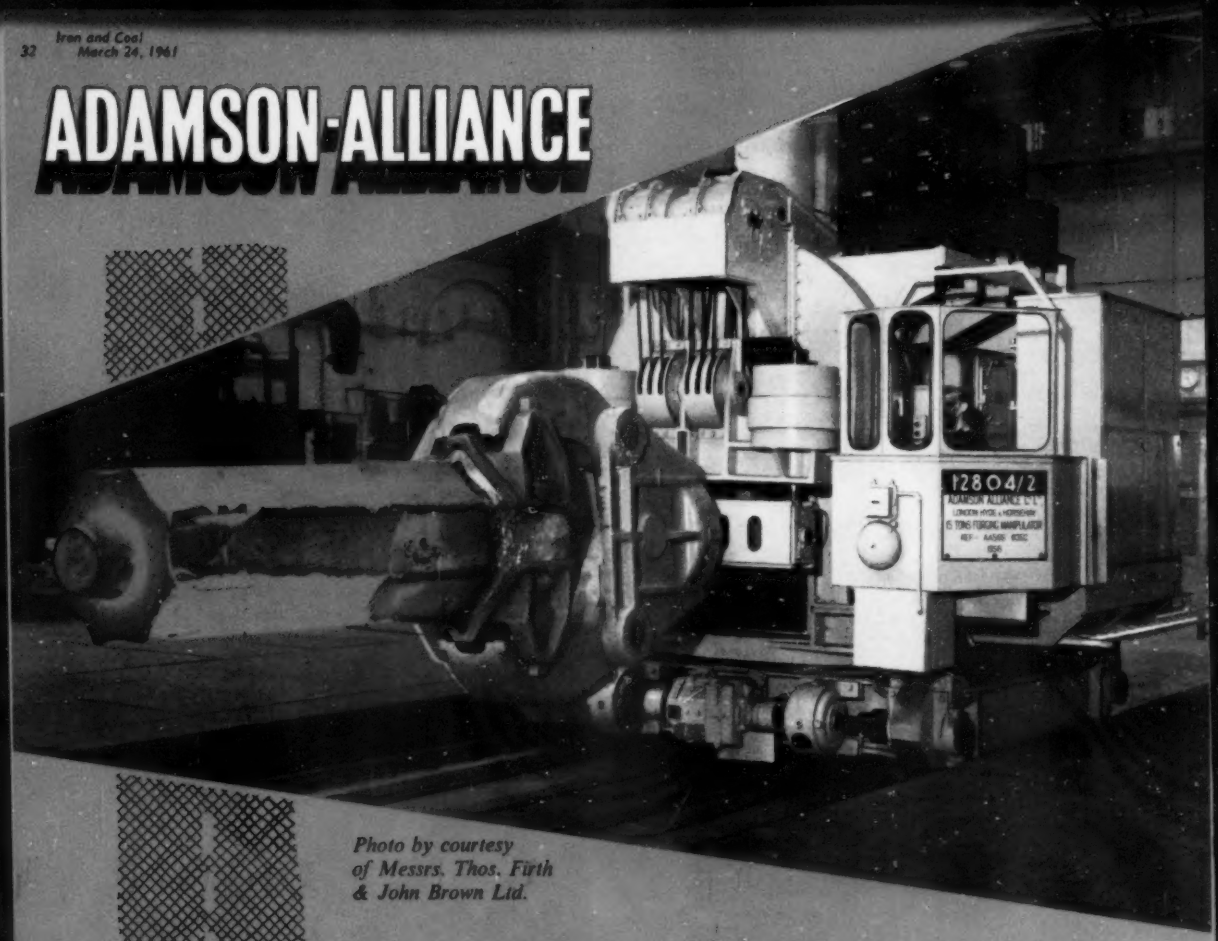


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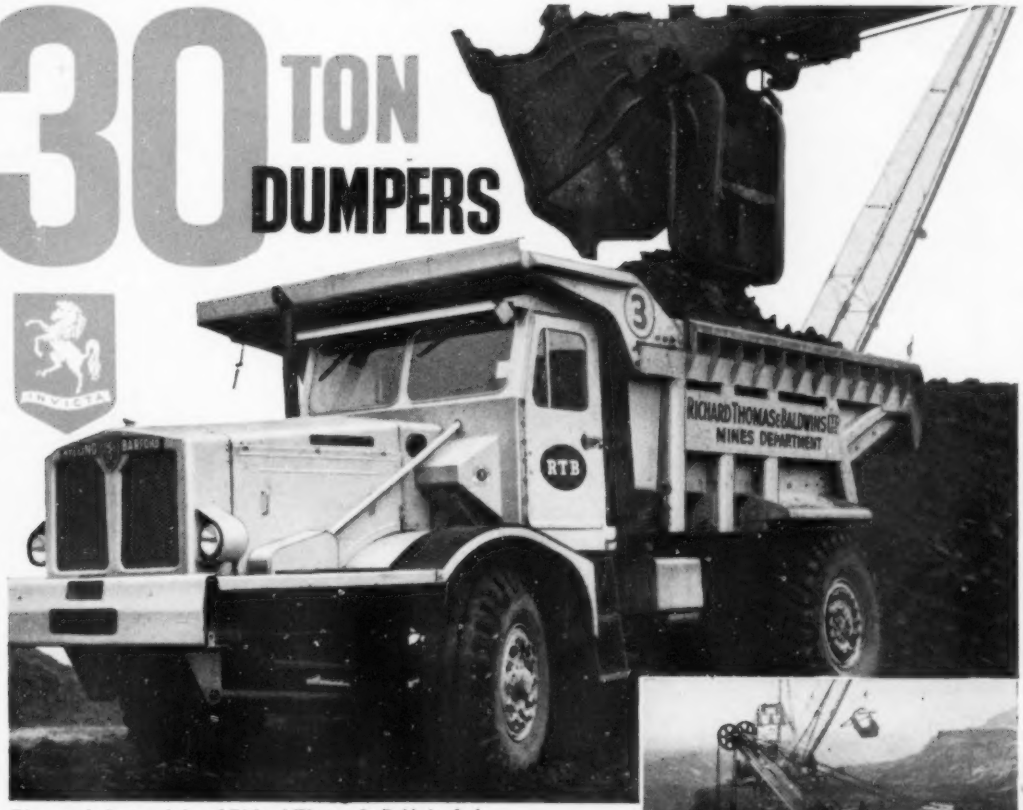
# 30 TON DUMPERS

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For full particulars of the 'SN' write for publication No. 1852.

# Aveling-Barford SN 30 TON DUMPER

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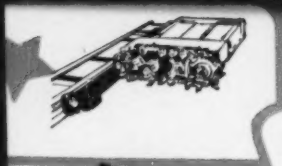
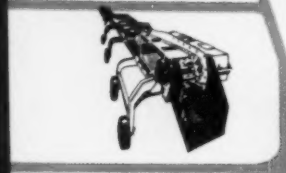
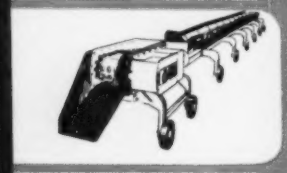
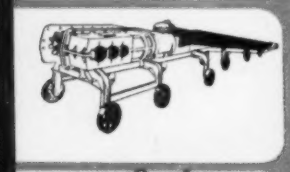
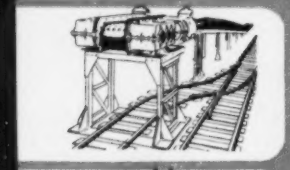
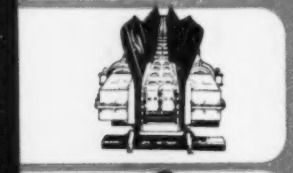
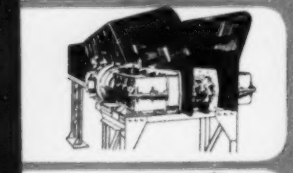
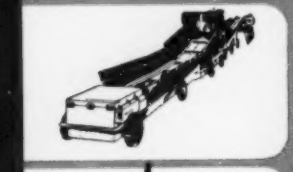
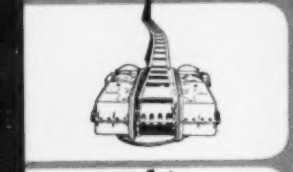
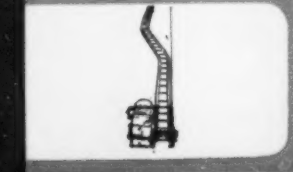

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Crawley products are of high capacity, rugged in design and low in maintenance cost. They have a high degree of standardisation and interchangeability of parts, and offer an efficient and sure solution to the conveying and power loading problems common to the longwall system of mining throughout the world.

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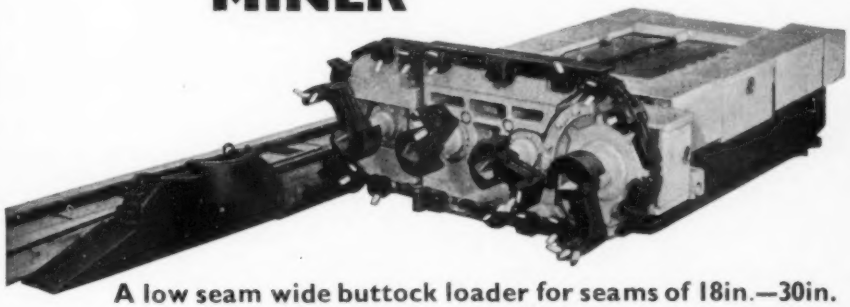
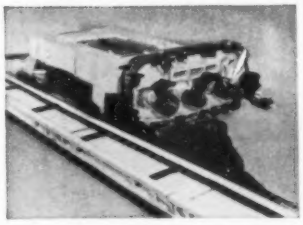
# CRAWLEY MIDGET MINER

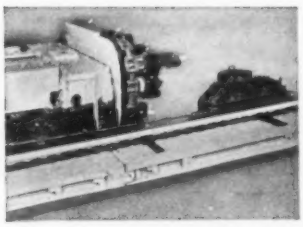


**A low seam wide buttock loader for seams of 18in.—30in.**

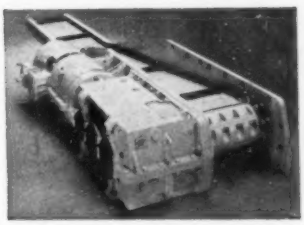
The machine as illustrated is single ended and has four boring arms spaced at approximately 72° lag to each other. These operate ahead of the periphery chain which clears any uncut and unloaded coal. The chain includes flight pick boxes specially designed to ensure complete loading of coal.



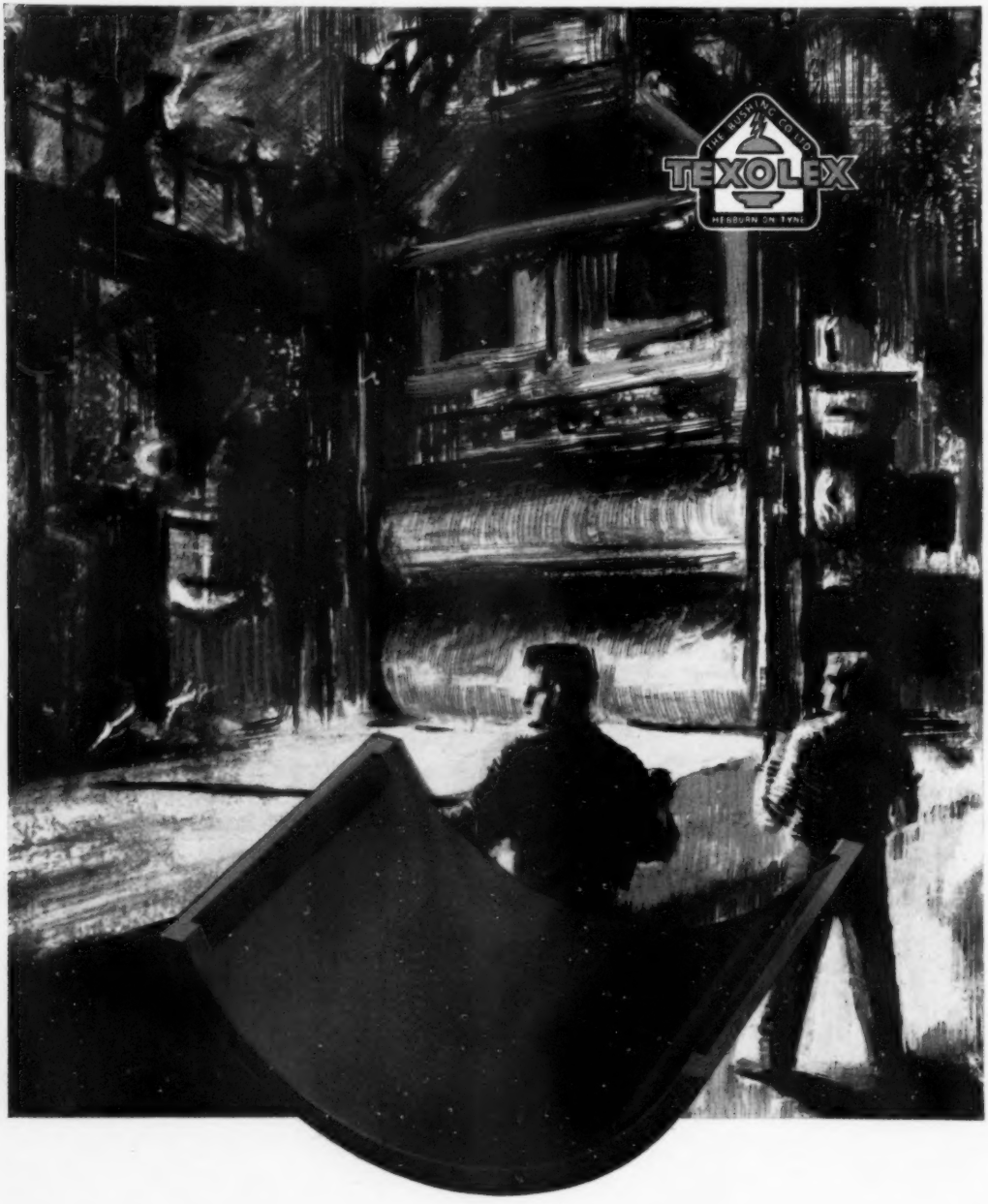
An efficient water jet dust suppression system is an integral feature of the machine.



Outputs equivalent to 200 tons/shift in seam height of 2ft. 6in. have been achieved, with considerable improvement in output per man shift.



*The illustrations on either side show the C5 Lo-hite conveyor currently in use with the Midget Miner*

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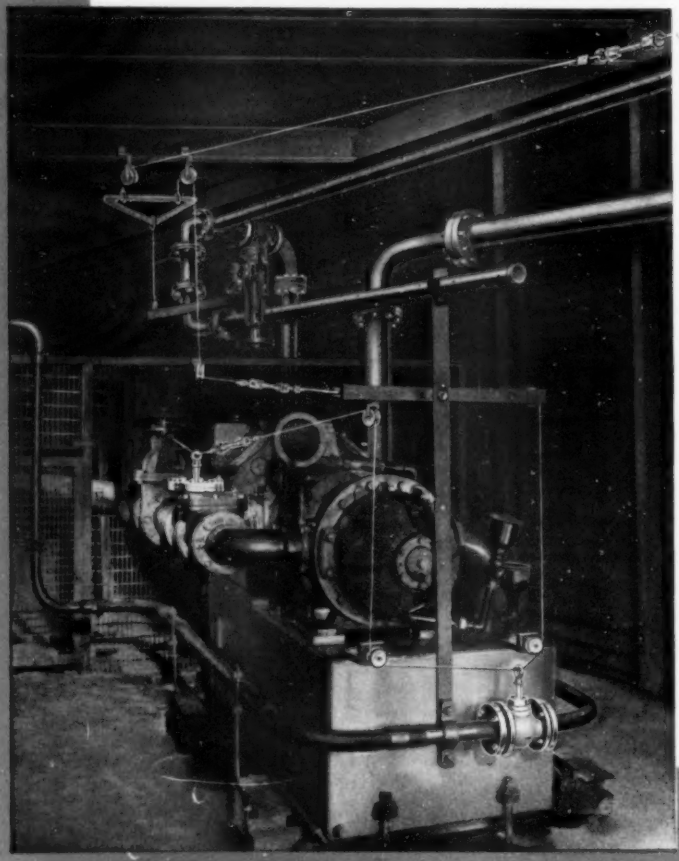

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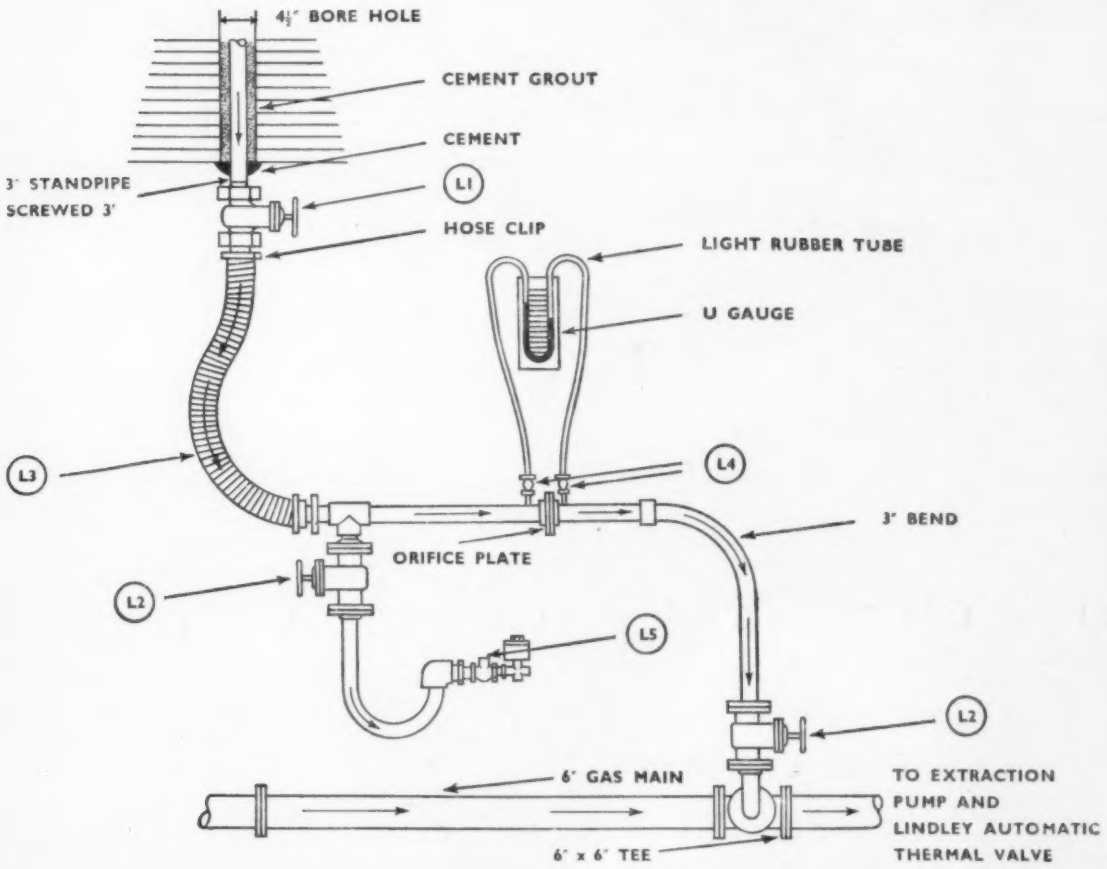


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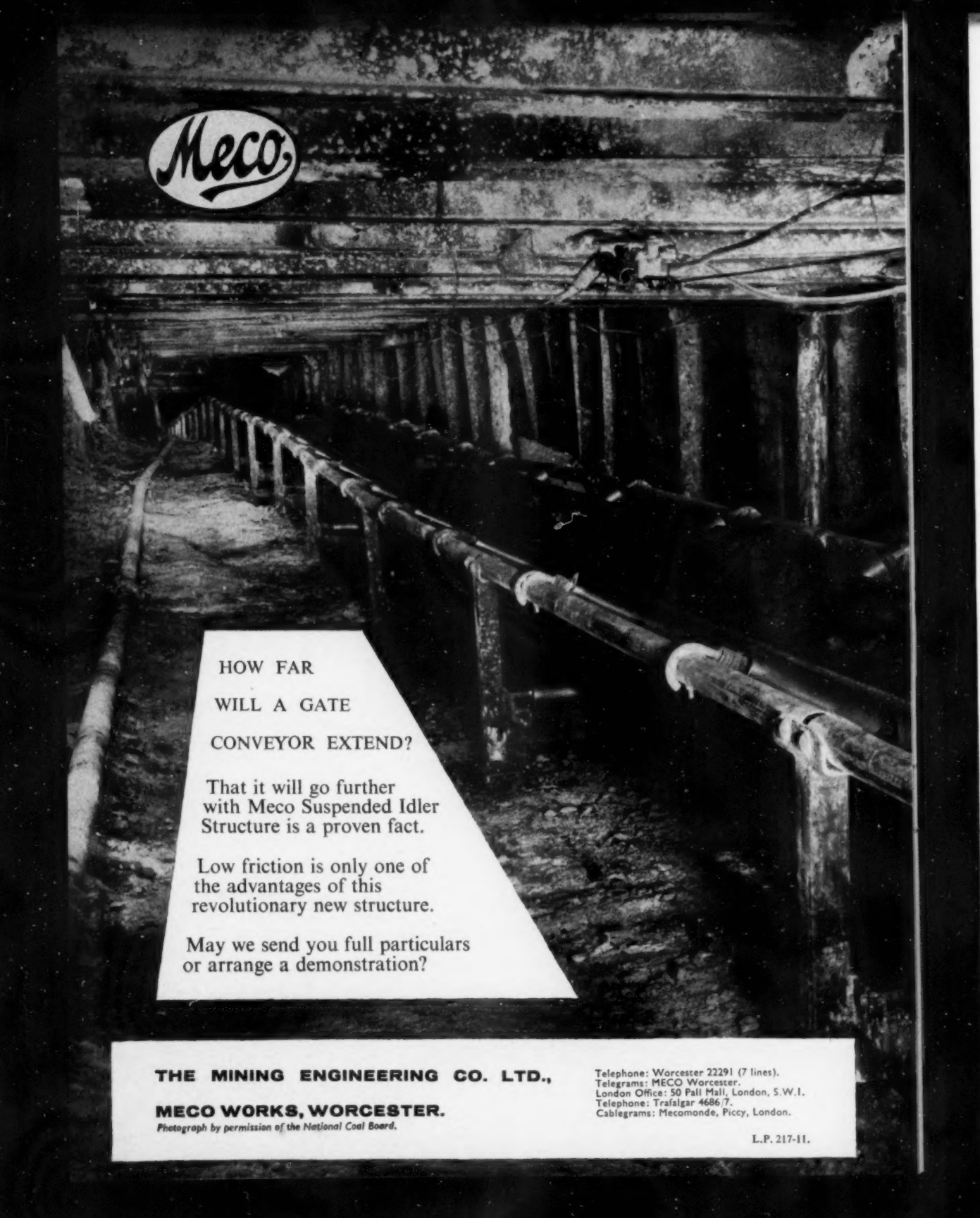
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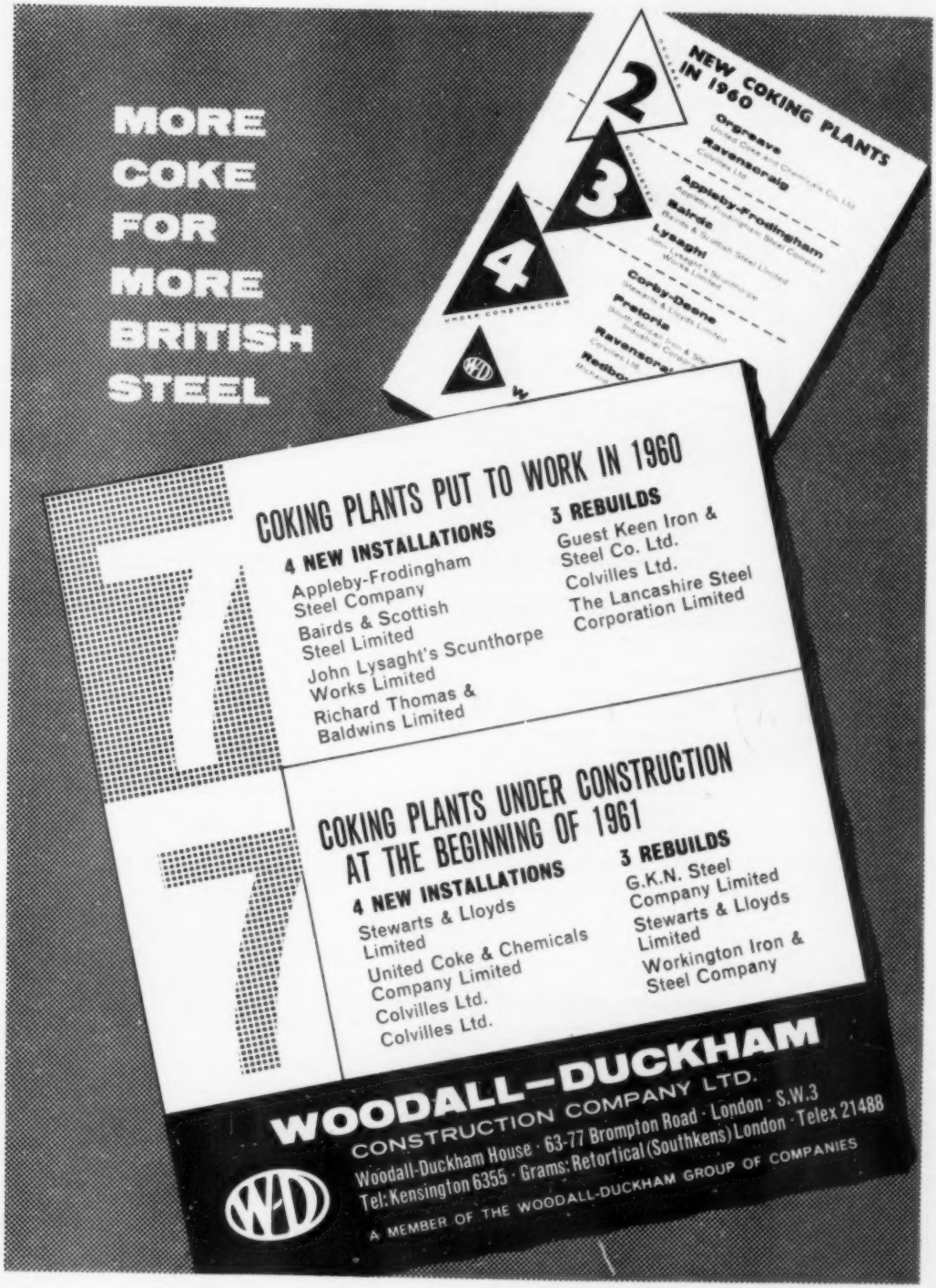
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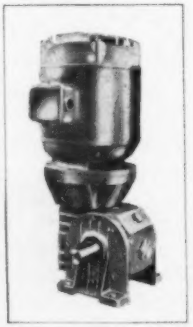
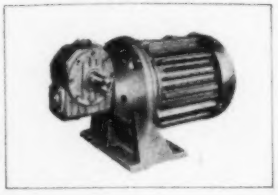
*Please write for catalogue V.60 which gives further technical information.*





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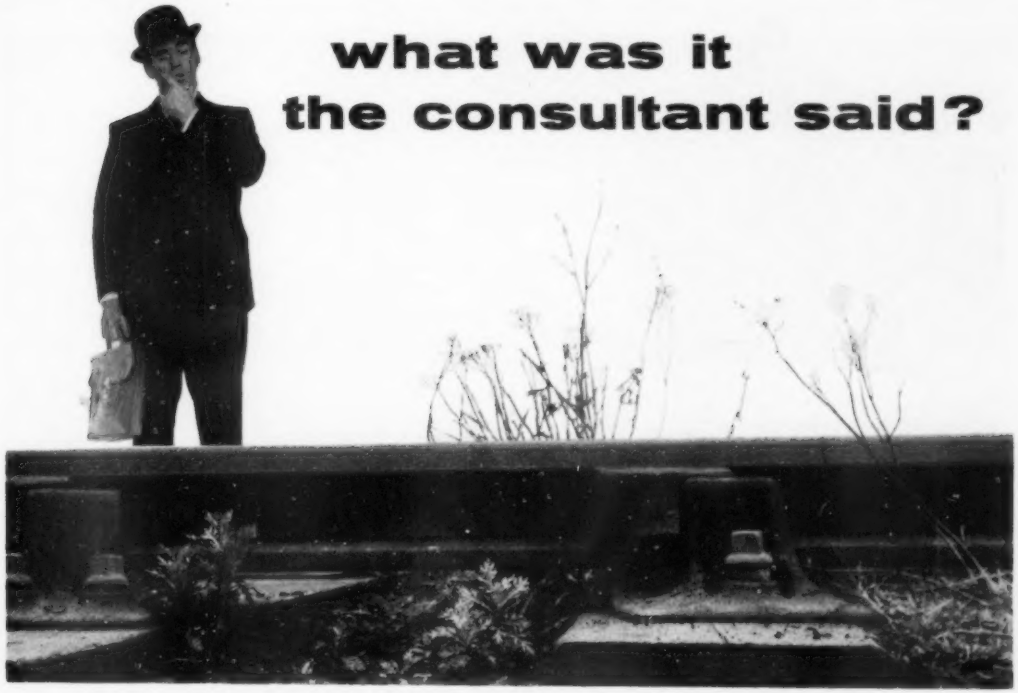
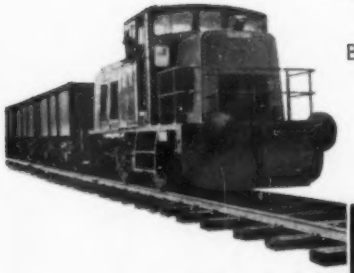
CRC 87

# what was it the consultant said?



"Internal rail haulage costing too much. Fuel bills too high.
Wasting money on unproductive time. Those locos...too old...too slow...
too dirty. What do **we** want? Diesels obviously. Cheaper to run.
Always ready to go. Long service life and long usefulness
between overhauls. Simple. Safe.
But whose? **Must** be RUSTON I think. Reputation for absolute
reliability. Will find out more about their latest machines..."



RUSTON

*DIESEL - HYDRAULIC*
*DIESEL - ELECTRIC*
*DIESEL - MECHANICAL*

## diesel shunting locomotives

***... there's a lot more to know too. Ruston locos have many advanced design features. Easiest accessibility to engine and running parts - maximum visibility from the cab - simplicity of driving controls - and many more.***

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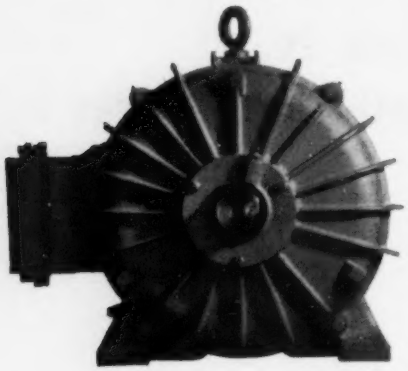
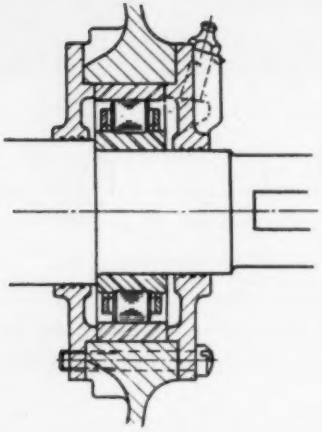


Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on know-how or experience.

# This thing called know-how



Take for example bearings. We were amongst the first manufacturers to fit ball and roller bearings to electric motors and, in fact, they were standard equipment on our machines whilst the majority of motors still had sleeve bearings. The ubiquity of ball and roller bearings on motors today indicates how right this early choice was. There is a small but important detail in which the housings of the bearings on our motors differ from those on many others. We bore the end-shield clean through and fit two caps. The through bore allows of more accurate gauging—particularly with regard to parallelism—than a blind hole and the cost of the extra cap is in our opinion more than justified by this and by the better grease retention it makes possible.

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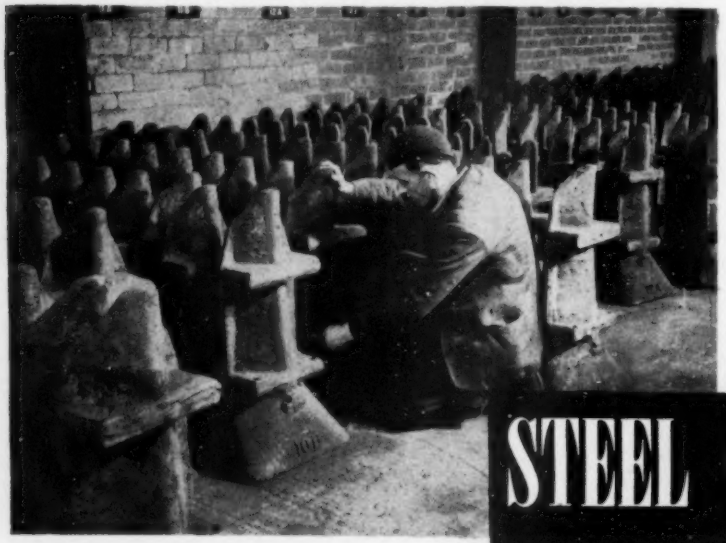
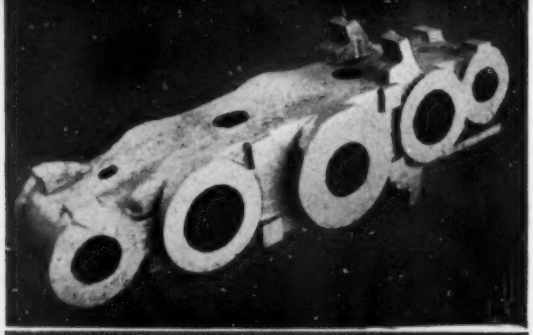
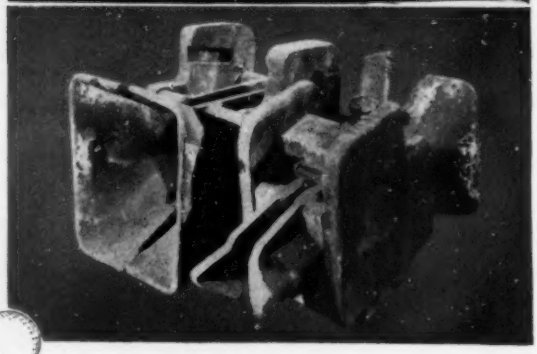


# STEEL CASTINGS





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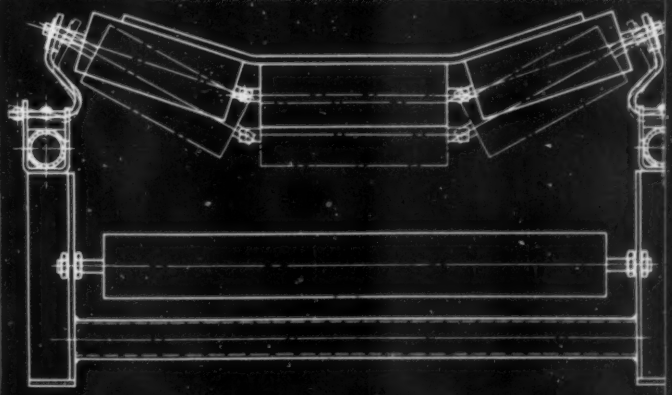
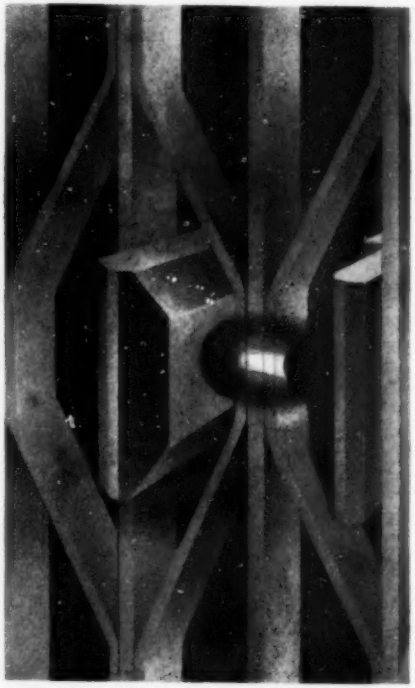


# the unique SAFETREAD resistance welding method cuts corrosion



"Safetread" steel flooring is *homogeneously resistance welded under pressure*—thus closing the grain of the material and providing a highly corrosion-resistant joint of great strength. "Safetread" floors installed for many years under rigorous conditions show that the least corrosion has taken place at the point of welding. Welded through the neutral axis of the main bar, maximum strength and lateral stability is also gained.

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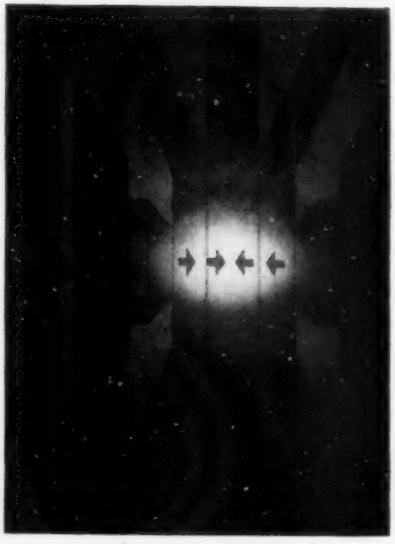

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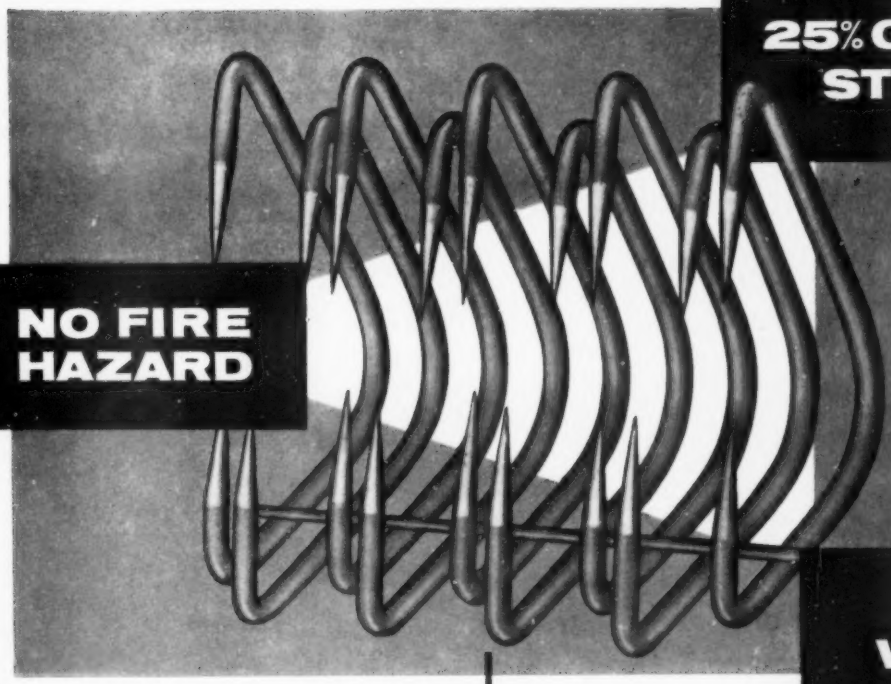

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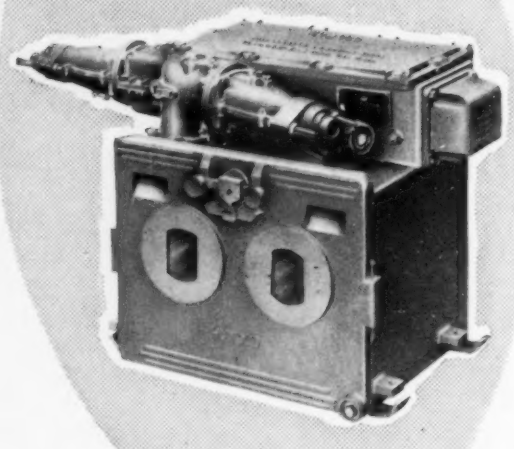

General view of Huwood Recording panel with B.I.C.C. flit plugs.

# The HUWOOD FLAMEPROOF RECORDING PANEL Type HM12

The instruments most frequently supplied with the panel are a combination of ammeter, voltmeter and kilowatt meter controlled by a common drive and recording on separate charts, but the panel is suitable for power factor meter, frequency meter or integrating kilowatt hour meter.

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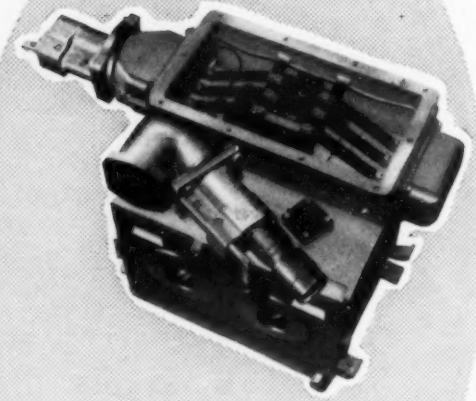
## A VERSATILE RECORDER

View of panel from above. Fitted with incoming and outgoing Huwood 100 amp. plugs and sockets. Provision for direct reading voltmeter (or ammeter).



Can be used with pliable armoured cable fittings such as the Huwood 100 & 30 amp. plugs—Groups I & II.
. . . with B.I.C.C. flit plugs—Group I, or with Huwood cable box—Groups I & II.

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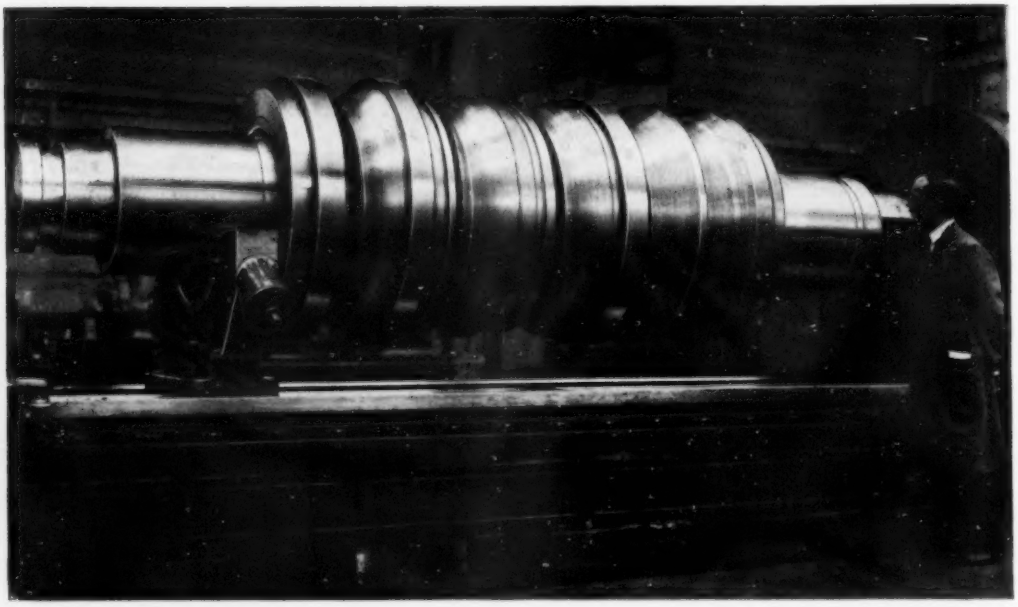
# WHAT'S YOUR ANGLE ?



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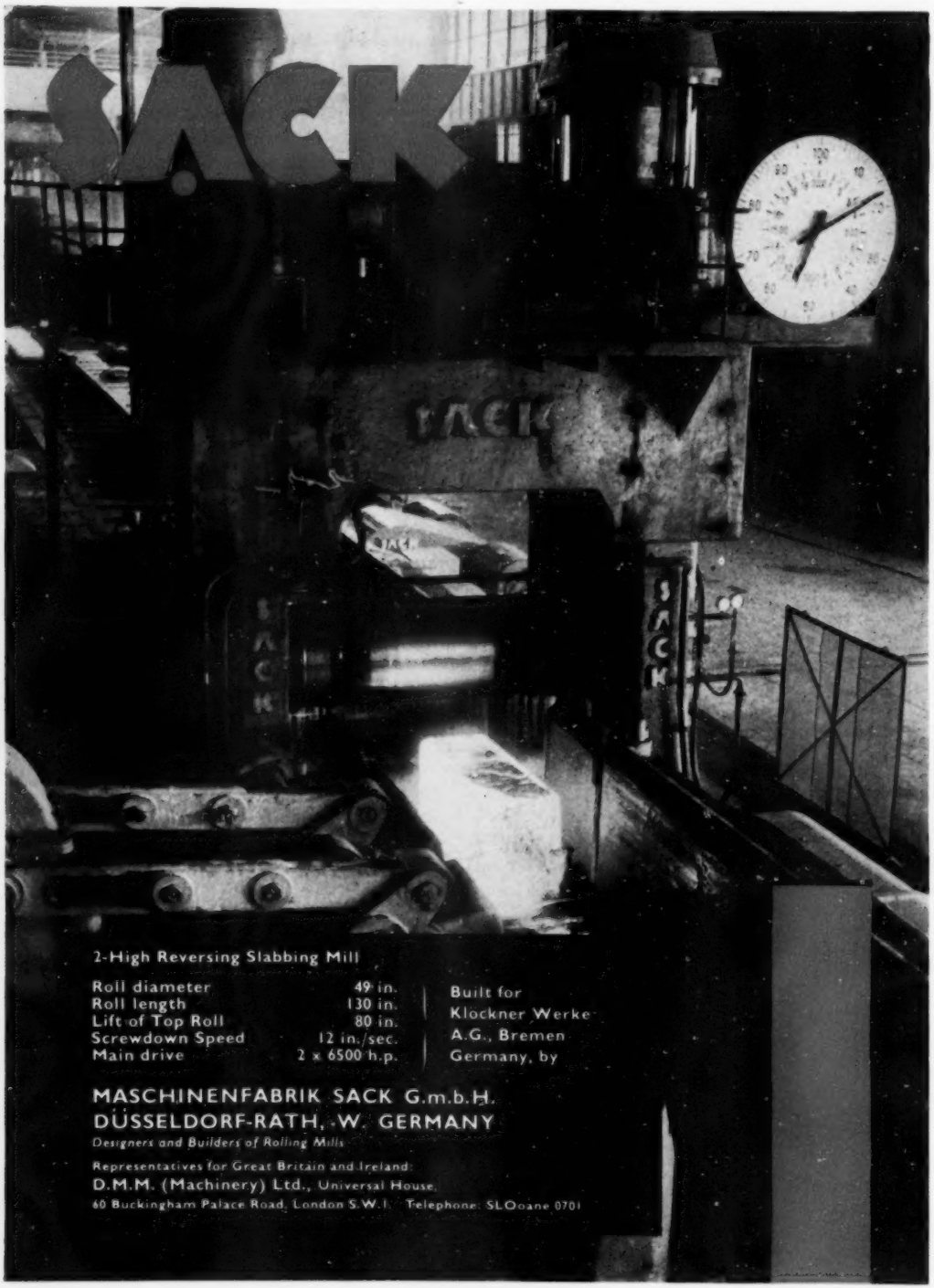


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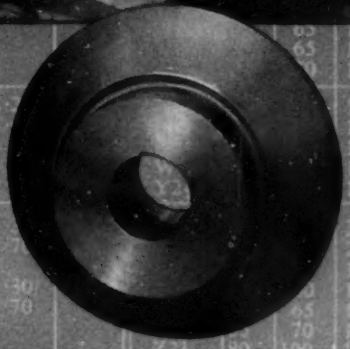

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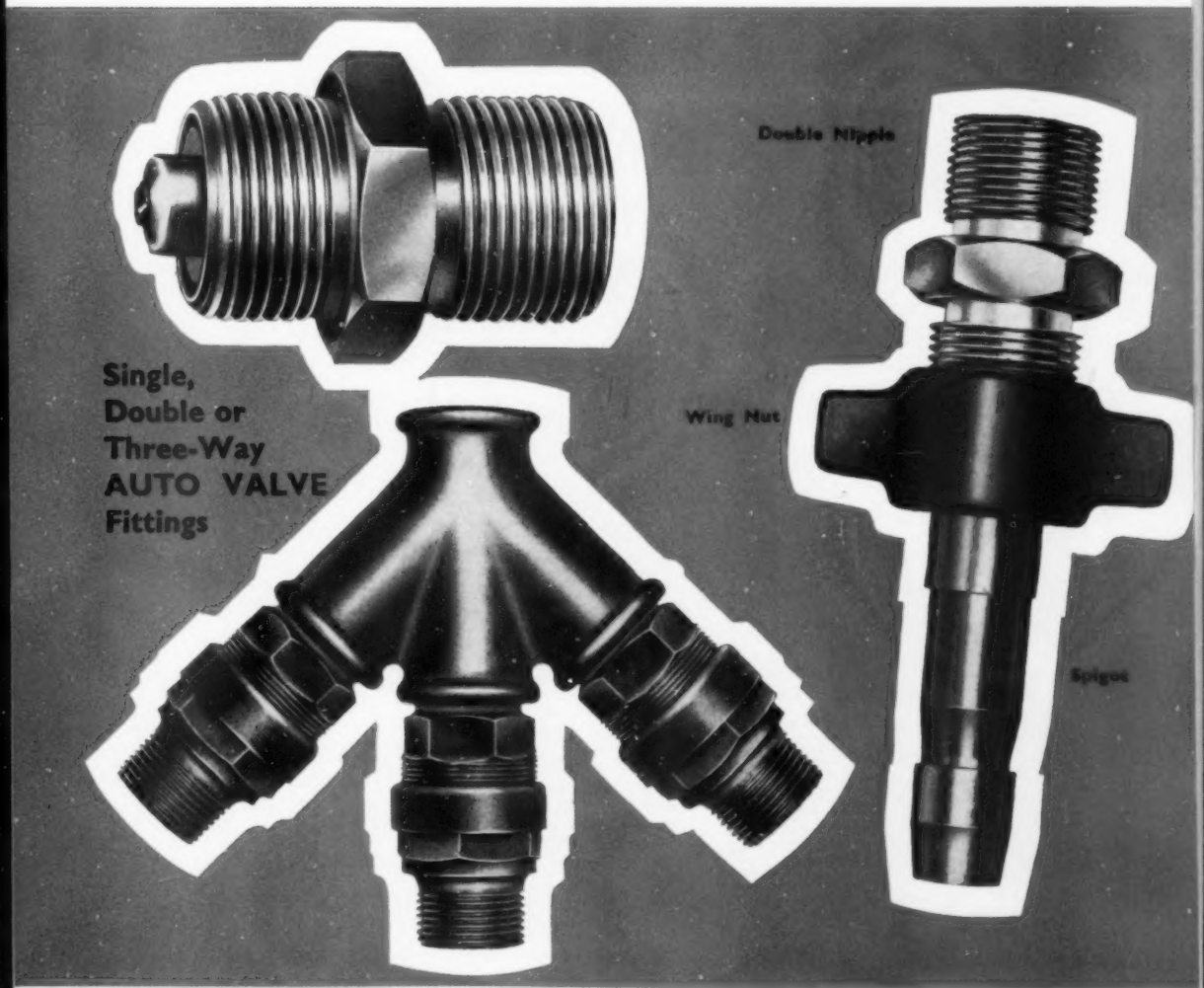


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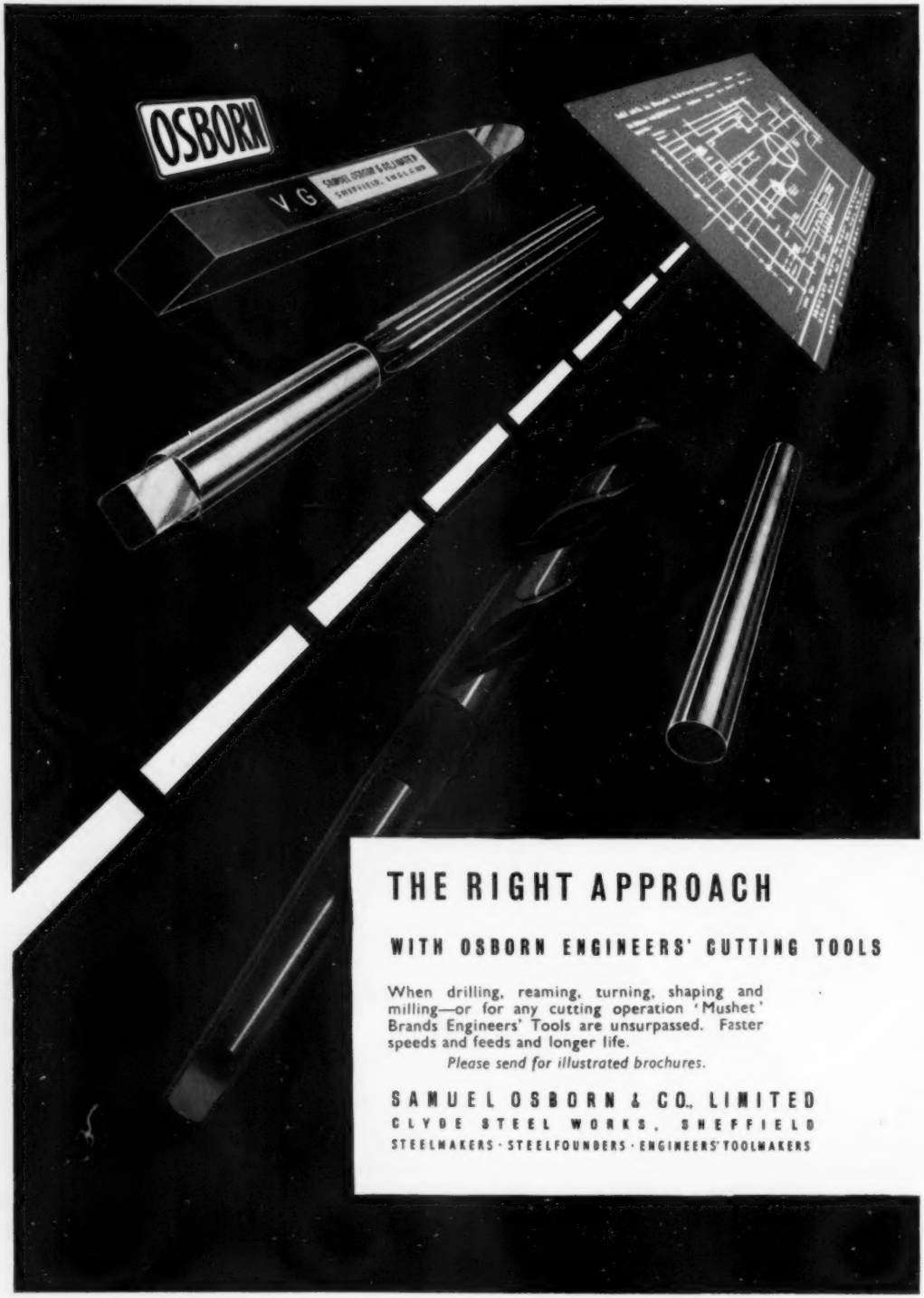


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Vol. 182
No. 4836

# IRON & COAL

THE IRON AND COAL TRADES' REVIEW

MARCH 24
1961

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# *"This is why 'FASTEX 5' is Britain's top selling welding electrode..."*

More Murex " Fastex 5 " welding electrodes are sold in Great Britain than any other type and this is why—(1) The quality of " Fastex 5 " is high and consistent. (2) It is an extremely efficient electrode—fast in operation, smooth running, capable of producing high quality welds with an absence of undercut. (3) " Fastex 5 " is simple to use and slag removal is easy. (4) Although primarily designed for downhand welding, the electrode can be used in other positions. (5) It is suitable for a wide range of fabrication work and can be used on a variety of mild steels. (6) It is backed by the most modern manufacturing and research facilities and a first class sales and service organisation. And its price is competitive! No wonder " Fastex 5 " is Britain's top selling electrode.

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

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# *Inventors or Copyists*

WHEN the head of a large steel concern makes bold to criticize the steel industry, as did Mr. H. F. Spencer, managing director of Richard Thomas & Baldwins, Limited, recently, the industry should take note. Mr. Spencer charged that the United Kingdom has for many years been importing, copying, and using under licence foreign processes and types of equipment instead of inventing its own. He was speaking at a meeting of the Ebbw Vale Metallurgical Society, that is, to an audience composed mainly of metallurgists, many being from his own company. Thus he could exercise his flair for forceful and colourful speech without fear of misunderstanding. Few metallurgists in Britain, however, will disagree with the content and spirit of his speech.

If we look back 10 or 15 years we have to concede that the UK has been outclassed in inventiveness in steelmaking. The new oxygen processes are an obvious example. Granted that the invention of the LD or Kaldo processes did not fall to our lot, it is a pity that the British steel industry did not try out these processes in their infancy, thus showing interest, at least, in a new idea and assisting in its development. This may be regarded as advocating a form of copyism, but it is a good rule to follow-up without delay every idea which comes along, no matter from what source, for in the developing of an idea other ideas often emerge.

Another instance of failure to attempt the development of an idea initiated abroad is in the field of vacuum degassing of steel. This failure has already cost the UK steelmakers dearly. IRON AND COAL on March 3 and March 10 this year published in two parts a translation of a paper entitled "Ten Years' Large-Scale Vacuum Degassing of Steel." It is six years since the Bochumer Verein publicized the process as a method of producing steel for making heavy forgings of superior quality. In these intervening years almost every country which makes steel for forgings has brought at least one large vacuum degassing plant into commission. In the UK, the home of the heavy forging industry, buyers of rotors for power plants have been obliged, in order to obtain the best quality material, to purchase vacuum degassed forgings from abroad. Some time in 1961 there will be a relatively large vacuum degassing unit in Britain. It will be a Bochumer Verein plant that could have been purchased much earlier.

In this field the loss to the UK is not only the loss of a few orders for rotors; we have lost prestige also, not to speak of the valuable time wasted in learning the "know-how" of vacuum degassing. We shall be following, not leading, for many years to come, because the steel industry, though well informed from the first, failed either to copy foreign methods or instigate a massive research effort to develop a vacuum degassing method which it could call its own. It is to be hoped that a recent announcement by the British Iron and Steel Research Association, indicating that vacuum degassing research will be a prominent exhibit at the Open Days of its Sheffield Laboratories, means that we shall yet make up for lost time.

There are, of course, many successful developments to the credit of the British steel industry. In particular, the sintering of iron ores and the automatic gauge control for strip rolling may be mentioned. These two developments have been so enthusiastically taken up in other countries that it is easy to overlook the fact that the ground work was done here. The role of the UK in the development of the continuous casting process is very creditable. If not the first to do serious research work on the idea, BISRA was certainly an early entrant into the field. Present plans for large continuous casting installations in this country ensure that Britain will be in the forefront in the commercial application of the process.

No one would claim that inventions can be obtained to order, but an encouraging receptive atmosphere surely helps. If inventions spring from necessity little delay in their application arises; if they are born of curiosity and speculation their development is less certain. One way to hasten the perfection of an invention is to report and debate it widely, for then it is more likely that someone, somewhere will hit upon the most appropriate application.

## Slight Rise in Materials Costs in Industry

AVERAGE prices of basic materials purchased by manufacturing industry in the UK rose slightly in February, according to figures given in the Board of Trade Journal. In the engineering and electrical industries, prices of tin, lead, zinc, and copper recovered from the decline over the past three months.

An increase in the price of iron castings also contributed to the higher materials costs in the engineering and electrical sectors, but the fall of nearly 5 per cent. in the price of raw rubber had a restraining influence.

HOPE WAS ABANDONED last week of saving 26 miners, 24 of whom had gone to the rescue of the other two, trapped when fire broke out more than 3,000 ft. below ground in the compressor room of the Otsuji Colliery, Katsuki, south Japan.

# *Passing Thoughts . . .*

IT is always difficult to say which tax changes are most desirable in order to make this country more export-minded. One of the best arguments for a cut in surtax is to make it easier for firms with a dearth of executive ability to entice the lieutenants who are now wastefully congregated in the export departments of a few very big firms into their own top salary jobs —without the whole differential which they offer being taxed away; most people will agree with last year's closing of the tax loophole over the golden handshake, but what one wants now is to introduce some sort of golden welcome instead.—The Economist.

*The country is living off the nervous energy of the men at the top who can't stop.*—MR. VINCENT JOBSON, *chairman of Qualcast, Limited, quoted by "Observer" in the Financial Times.*

There is more nonsense talked on the topics of strikes in industry than on almost any other subject which is discussed. It does a great deal of harm to the relationships in industry . . . people get the impression that strikes in industry are far more rife than in fact they are. It has been said many times that if the British worker were as irresponsible as he is sometimes made out to be, British industry could not function.—MR. RICHARD MARSH, Labour MP for Greenwich, opening a debate on industrial relations in the House of Commons.

*Even now I am not sure what a white collar worker is. It is a term from "way back," but today I know of miners who go to the pit in their cars, and who go on to the golf club after having had a shower at the pit. It is common in America for miners to go golfing before breakfast and then to go on to the pit. In one sense, we are all white-collar workers now.*—MR. FRANK TOMNEY, *Labour MP, speaking in the same debate.*

When a young man comes into a British factory he wants to feel that he is appreciated. He wants to feel that after he has been decently educated he is not just treated as a cog in a wheel. He wants to feel that there is a future before him and he wants to know the line of promotion. If he is a conscientious lad he wants to know that he will not have to work on one machine for the rest of his life with no promotion or opportunities to look forward to other than what the union can gain for him. The factory should recognize the ambitions of such a man, especially after he has married.—SIR W. ROBSON BROWN, another speaker in the debate.

*This has been a confusing winter for the National Coal Board.—Daily Telegraph.*

A big impact on public opinion [towards cleaner air] should come when the Coal Board's long-heralded smokeless fuels for open fires reach the market in two or three years' time. But while we are waiting, the Government should puff more strongly at the mental smog which hangs low over so many municipalities. Clean air is quite as important to the nation as differential rent schemes.—The Guardian.

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WEST GERMAN State-owned coal mining concern, Bergwerksgesellschaft Hibernia, AG, of Herne, last year produced 10,000,000 metric tons of hard coal, or 2.9 per cent. less than in 1959, while coke output fell by 10.8 per cent. to 2,130,000 tons. At the same time, OMS rose by 187 kg. to 1,978 kg. The company's turnover rose to DM 780,000,000 (DM 744,610,000).

# Master Cutler's Guests Tour Park Gate

ON Wednesday of last week, the morning after the Cutlers' Feast, the Master Cutler, Mr. C. H. T. Williams, according to ancient custom, took his guests on a tour of the company of which he is chairman, the Park Gate Iron & Steel Company, Limited. The 11 in. continuous bar mill which came into operation on the Roundwood site five years ago was the first plant to be visited. This modern mill is equipped to roll round, hexagonal, and square bars and certain flats and other shapes to close tolerances.

It produces bars of from $\frac{1}{8}$ in. to $1\frac{1}{16}$ in. in either straight lengths or coils in mild and carbon, case-hardening, free-cutting, and low alloy steels. The 3 in. and 4 in. square billets, usually 18 ft. long, which are processed here come from the company's billet mill. They are side charged into and side discharged out of one of the two continuous, recuperator-type reheating furnaces, which are fired by liquid fuel. They then pass through five stands of 16 in. roughing rolls and four stands of 12 in. intermediate rolls to a flying shear which trims the bar ends.

The semi-finished bars then pass to a train of eight stands of 11 in. finishing rolls, the four alternate stands having vertical rolls, then on to a flying shear or to the coiling equipment which consists of four coiling machines of the pouring type. The cooling conveyor, which the coils then reach on slat conveyors, is a hook conveyor nearly 1,700 ft. long with hooks spaced 7 ft. 6 in. apart.

The cooling bank for cut bars is over 250 ft. long and about 21 ft. wide with two straightening pockets from which bars are transferred to shuffle racks and assembled for shearing. The shears operate at 25 strokes a minute and will cut 12 bars of 1 in. diameter at each stroke.

The 480 visitors were able to see the complete process in comfort and safety from raised gangways.

The visitors then moved on to the bar treatment department. Here, in preparation for cold drawing, the bars are pickled in dilute sulphuric acid, washed, and dipped in a lime bath. They are annealed in coiled form in bell-type furnaces, which are oil-fired and have the inner covers filled with a controlled atmosphere of either "DX" or "RX" gas produced from town gas. The prepared bars are then cold drawn on Marshall Richards' heavy duty vertical bull blocks to finished diameters ranging from 0.30 in. to 1.2 in diameter.

Before luncheon, the guests were shown a film of the Kaldo process of steelmaking. This process will feature prominently in the £33,000,000 development plan now under way at Park Gate. They also toured an exhibition of the progress and developments of the Tube Investments, Limited, group, of which Park Gate is a member.

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## $13,000,000 Loan for Spanish State Steel

LOAN of $13,000,000 (£4,650,000) is to be made by the Export-Import Bank to the Spanish State-owned steel company, Ensidesa, to complete the company's installations in Avilés (Asturias).

When the equipment, to be purchased in the US, is installed the Avilés plant will be a completely integrated steel mill and will be able to furnish the Spanish market with a new range of quality steel products.

# *Steel Industry Optimistic*

## PLANS FOR UK CAPACITY OF 34,000,000 TONS

AN optimistic attitude is being maintained for 1961 by the iron and steel industry, which holds to the view that crude steel output this year might reach a total of 24,500,000 tons, said Mr. C. R. Wheeler, president, at the annual meeting of the British Iron and Steel Federation on Tuesday. The industry, he said, drew strength from expectations that activity in the investment field would remain high, that consumers would maintain their stocks of steel in face of current cost trends, and that the Government would ease credit restraint sooner rather than later in the year.

Mr. Wheeler, a director of the Steel Company of Wales, Limited, and a vice-chairman of Associated Electrical Industries, Limited, went on to say that the industry hoped that exports in 1961 would be on an even higher level than last year's record. It believed that demand would grow by 1965 to about 30,000,000 tons, and companies' plans already envisaged a steel capacity of 34,000,000 tons.

MR. C. R. WHEELER

The president pointed out that the recent increase in the price of coal had added some £19,000,000 a year to the industry's costs, and that this was leading to even more vigorous thinking on development in planning in relation to fuel supplies, and on ways of reducing its vulnerability as a "captive market" for British coking coal. The industry was also threatened by further cost increases through the introduction of the Rating and Valuation Bill, unless this was amended, particularly in regard to the wholly inequitable rating of process plant.

### Pressure Upon Home Supplies

Mr. Wheeler said that any review of the British steel industry in 1960 had to start from one simple fact, namely that crude steel production, at 24,300,000 tons, was nearly 20 per cent. higher than in the previous year and some 12 per cent. above the previous record set in 1957. Steel exports, at 4,100,000 ingot tons, were also a record. Though last year was by no means without its problems and anxieties, especially in the closing months, considered as a whole it was a year of buoyant expansion.

The problems which 1960 brought were largely those arising from over-strain. Despite the record output produced by the hard and efficient work of managers and men throughout the industry, the demand for steel for use at home and for export rose so sharply that it pressed hard upon the available home supply, and in this situation the additional wasteful demand for steel for stock just tipped the balance of demand and supply and caused a significant increase in steel imports.

"We can take credit, however, for the fact that the expansion of the industry in recent years proved sufficient to allow us to meet last year's peak demand from home production over most of the field. Imports of finished steel were very largely confined to sheets, and the expansion plans of the sheetmakers seem more than adequate to avoid such imports in future. This better balance of the industry was seen also at the ingot and semi-finished steel stage and in the raw material field, where the volume of central transactions needed to allow the industry's finishing capacity to be kept fully employed was significantly lower than in previous boom years."

Although the marked increase in output last year was naturally accompanied by an increase in total steelmaking profits, the average profit margin changed little as against the previous year, Mr. Wheeler continued. Indeed, profit margins had come under considerable pressure from rising costs in the closing months of the year. Such a trend must cause the industry considerable concern, faced as it was with a development bill of over £200,000,000 this year. With this in mind, the Federation has been discussing with the Iron and Steel Board both the adequacy of the rate of profit currently allowed in their prices and the £22,000,000 of additional costs which had fallen on the industry recently or were firmly in prospect.

In this context, he said, the coal price increase of September, 1960, warranted special mention. This was a serious blow to the industry. In the immediate sense, it would add some £19,000,000 to costs, either directly or by provoking consequential price increases elsewhere. In a longer-run sense, it had set under way new thinking on development planning in relation to fuel supplies and on ways of reducing the industry's vulnerability as a captive market for British coking coal. The Federation had made representations against the increase to the Industrial Coal Consumers' Council.

Another event of 1960 which threatened further cost increases in the future was the introduction of the Rating and Valuation Bill. The Federation had taken a lead in rallying industrial opposition to it, both in the Press and in Parliament, and found many allies. It was hoped that satisfactory amendments would yet be secured during the Bill's passage through Parliament, particularly with regard to the wholly inequitable rating of process plant as well as buildings, which bore especially heavily on the iron and steel industry.

These cost increases, Mr. Wheeler went on, were only one of the anxieties which began to press on

the industry in the closing months of last year. Most prominent amongst these was the appearance of a downturn in economic activity, especially in the field of consumer durables. Indeed, 1960, which had started with the trend set strongly upwards, ended with falling order-books in most parts of the industry and with short-time working reappearing in one section.

"Nevertheless, the industry maintains an optimistic attitude towards the probable outcome in 1961. The Federation has expressed the view that crude steel output in 1961 may reach 24,500,000 ingot tons, slightly in excess of the 1960 peak. This view takes account of movements now being seen in the motor industry and other consumer durable trades, and draws strength from the expectations that activity in the investment field will remain high, that consumers will maintain their stocks of steel in face of current cost trends, that the Government will ease credit restraint sooner rather than later in the year, and also . . . that exports will be pressed vigorously in 1961 to a level which we hope will be even higher than last year's record."

The steel industry was well placed, not only to produce 24,500,000 tons of steel this year, but to push output higher still if demand warranted it. Capacity available would reach 27,000,000 tons in 1961 and raw materials could be made available to sustain steel production at any likely level. With home production thus able to deal adequately with all likely demands, imports would be well below the 1960 level. This, taken together with the anticipated increase in exports, would still further increase the industry's substantial net contribution to Britain's balance of payments.

### Likely Course of Demand

An important part of the Federation's work in 1960, Mr. Wheeler went on, was concerned with assessing the likely course of demand into the mid-sixties and to ensure that capacity would be adequate to meet that demand. This exercise had been completed as far as the position up to 1965 was concerned, and in fact the Federation was now actively examining the 1970 position. The arrangements for forward planning in the steel industry were often misunderstood, he said. It was therefore worth repeating that the primary responsibility rested squarely on the individual companies, reacting as they saw fit to their assessments of market trends and taking full financial responsibility for the success or failure of their judgments.

This position, however, did not preclude other influences from coming to bear, of which two deserved special mention. Firstly, companies' plans were influenced by their joint review of the longer-term position, made through the Federation. The development booklet soon to be issued by the Federation would contain a useful description of this process. Secondly, the companies' plans were also influenced by the independent review made from outside the industry by the Iron and Steel Board. But when such influences had been fully allowed for, it remained the individual companies who bore the primary responsibility in the development field.

The industry's review of the demand-supply position up to 1965, which was to be set out in the Federation's development booklet, suggested that the demand for steel for home use might reach 25,000,000 tons by the mid-sixties and that export requirement might then reach about 5,000,000 tons, making a total demand of about 30,000,000 tons, compared with just under 24,500,000 tons in 1960. On the supply side, the companies' plans would raise steel capacity to about 34,000,000 ingot tons by that time. This comfortable margin of capacity over estimated demand was repeated for almost all the individual products, and in general, the industry expected to be in a position in the mid-sixties to meet all demands made upon it.

The focus of concern, however, was clearly moving away from the post-war problems of shortage to the possible dangers of over-expansion. In large measure, most of the difficulties which were in sight could probably be met in positive ways. In particular, the companies, and within its own sphere the Federation, would have to take active steps to bring demand up more nearly in line with supply, both by vigorous work in the market development field at home and by pressing still harder for bigger exports abroad. Moreover, some relaxation of the pressure for maximum output at all costs would give the industry more scope for improving its cost efficiency by withdrawing older plant—although, since this process had already led to the retirement of some 6,000,000 tons of blast-furnace capacity and some 5,000,000 tons of steel furnace capacity since the war, there would in fact be little obsolete capacity left by the mid-sixties. Even so, the possibility that problems of excess capacity might still arise warranted careful thought.

### Vicious Cycle of Stock Fluctuations

Mr. Wheeler said that one major enemy of steady growth, both in the economy at large and in the steel industry itself, was the vicious cycle of stock fluctuations experienced in recent years. In the steel industry the strain felt during the 1955-57 boom was intensified by the addition of 1,500,000 tons of steel to consumers' stocks. Then, under-employment of capacity during the 1958-59 recession was aggravated by the decision to take 1,500,000 tons of the smaller use of steel from stock rather than direct from the mills. In the 1960 boom, the pendulum again swung the other way and the strain of higher usage was increased by a stock-build of 1,200,000 tons.

Such stock fluctuations formed one of the most serious problems facing the industry today, and merited careful attention. Moreover, they could seriously harm the nation at large. Last year, the import of finished steel by consumers was very closely in line with the amount which they put into stock. Greater restraint by steel consumers in deciding their stocking policies might have improved Britain's balance of payments by over £50,000,000 last year without disturbing the course of their production.

Mr. Wheeler emphasized that although Britain's internal rate of growth was clearly governed by overall balance of payments limitations, detailed discussions by the Government and industry on future programmes and expectations might "remove some of the barriers to stable growth," and so "create an environment in which industry can unleash its full wealth-creating potential and plan for growth in greater assurance."

The steel industry, he concluded, welcomed the progres made with EFTA, but wider unity in Europe remained vital. The Federation had stated to the Government its belief that "the economic well-being of the United Kingdom, of the steel-consuming industries and of the industry itself would be promoted by a comprehensive and intimate relationship between the Six, the United Kingdom and the other EFTA countries." For the good of its customers, rather than for any direct advantage, the steel industry would welcome closer unity with the Six.

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HOME SALES CONFERENCE of Thomas Smith & Sons (Rodley), Limited, crane and excavator manufacturers, of Rodley, Leeds, was held at Rodley recently—the first to be held in three years. Attended by all the company's home sales and technical representatives, it included lectures on new developments and an intensive course on sales research and promotion.

# BRIDGING THE GAP

## *NCB's Policy on Smokeless Fuel Speeded Up*

PLANS for improving, increasing, and widening the range of solid smokeless fuels and for the production of fully automatic solid fuel boilers were outlined by Mr. Derek Ezra, director-general of marketing of the National Coal Board, to the Women's Advisory Council on Solid Fuel, on Thursday of last week. "Just around the corner," he said, "was a solid fuel boiler which would involve no more labour than simply turning on a switch."

Demand for smokeless fuels was growing not only because of smoke control legislation, but also because the public preferred these fuels, Mr. Ezra said. The Beaver Report had forecast that some 19,000,000 tons of bituminous coal would have to be replaced in the domestic sector over a period of 10 to 15 years. Since the Clean Air Act was passed five years ago, 470 smoke control areas, involving only 750,000 tons of smokeless coal, had been created. One of the reasons given for the lack of smoke controlled areas was that there was insufficient smokeless fuel.

Mr. Ezra maintained that this shortage arose because consumers were insisting on smokeless premium fuels and refusing gas coke, which the Beaver Committee had expected to take the brunt of the demand.

### Improved Appliances

The NCB's hopes, he said, lay in the new smokeless fuel being developed by Dr. Bronowski's team of scientists. Pilot plants for these fuels were producing products for market trials and plans were under way for building the first commercial plant to manufacture them in bulk. Within two or three years the fuel from the first plant would be reaching the market in fair quantity and by 1965 the output of the new smokeless fuel would top the 1,000,000-ton mark.

Turning to the central heating market, Mr. Ezra said that there was plenty of Sunbrite, increasing supplies of Phurnacite, and that the anthracite position would be improved when the new South Wales pits came into production. Experiments with anthracite duff showed that it was possible to produce a fuel from that. But apart from providing the fuel the board was also working with appliance manufacturers to produce a solid fuel boiler that was as efficient and labour saving as those currently produced for oil firing.

A surprise visit was paid to the meeting last week by Mr. Alfred Robens, chairman of the National Coal Board. Referring to the new smokeless fuel he said that the board had already "jumped the gun" by clearing the site for a commercial plant before the pilot plant had been fully tested. Sites were already being examined throughout the country for further plants and tests were being made on coals from several coalfields to establish their suitability for the new fuel.

"If within the first six months of operation the commercial plant shows that there are not too many risks, we will go ahead and do far more than we have guaranteed to do," Mr. Robens promised. "It is a big risk, there are bound to be teething troubles, but if you want the coal industry to be enterprising, you must permit us some failures."

## *NCB Losing on Coal Sold to Eire*

THE National Coal Board is losing 30s. a ton on 3,000 tons of coal being sold each month in Northern Ireland. This is because British coal exported to Eire is 30s. a ton cheaper than that sent to Northern Ireland, and because lorries from all parts of Northern Ireland collect coal from Eire instead of from the quaysides in Northern Ireland.

A spokesman for Londonderry importers said: "The only solution we know is for an import duty on coal coming from Eire." Importers in Eire deny that they are breaking NCB contracts because, they maintain, "once we have sold the coal to local merchants, we have no control over it."

In a letter to Mr. Robin Chichester-Clark, MP for Londonderry, Mr. John C. George, Parliamentary Secretary to the Ministry of Power, has said that the National Coal Board "has reminded the merchants in the Republic of Ireland of their contractural obligations not to re-export coal into Northern Ireland and, indeed, the board is trying to stop this traffic by every means open to it. Commercial action may go some way to solving the problem, but we do not expect it to provide a complete answer, and, as you know, we are considering with the Northern Ireland Government what more can be done."

## STEEL BRIDGE MAKES SEA TRIP TO LONDON

WEIGHING nearly 200 tons, a prefabricated welded steel bridge, built by Head, Wrightson Teesdale, Limited, a subsidiary of Head, Wrightson & Company, Limited, at its Yorkshire works, arrived at Regents Canal Dock on Saturday having been floated down the East coast and towed up the Thames to Stepney, a journey of three days. It is believed to be the first time a bridge has been despatched such a distance in this manner. The sea journey was made in order to avoid jamming the roads with pieces of heavy equipment and so that the bridge could be built in Head Wrightson's own workshops.

Of box type construction, the swing bridge will be used to carry both pedestrian and motor traffic over the entrance to the Regents Canal Dock. It was lifted into position soon after arrival.

FACTORY for the production of seamless tubes with diameters from 33 mm. to 273 mm. has been opened at Deville-les-Rouen, France, by Compagnie des Tubes de Normandie.

*Personal*

# President of Scottish Mining Institute

NEW president of the Mining Institute of Scotland will be Prof. GEORGE HIBBERD, Dixon Chair of Mining at Glasgow University, and Professor of Mining at the Royal College of Science and Technology, Glasgow. He succeeds Mr. J. M. Caldwell, managing director of Scottish Oils, Limited.

PROF. G. HIBBERD

Prof. Hibberd, who was president of the Scottish branch of the National Association of Colliery Managers for 1954/55, began work in the Ayrshire p.ts before he was 14 years old. He studied at the Royal Technical College, Glasgow, and in 1924 was awarded the Walter Duncan Research Scholarship and also gained his first-class colliery manager's certificate. Two years later he was awarded the associateship of the college in mining engineering, and worked on research into methods of rendering switchgear safe in explosive mixtures. For a thesis on this subject he received the degree of Ph.D. from Glasgow University.

On completion of his research work, Prof. Hibberd returned to the mining industry as assistant to the late Prof. D. Burns at the Royal Technical College, and in 1947 succeeded Sir Andrew M. Bryan in his present professorship. In 1954 he was made a Fellow of the Royal Society of Mining.

New vice-presidents of the Institute will be Mr. F. S. ANDERSON, a director of Anderson, Boyes & Company, Limited, mining machinery and switchgear manufacturers, of Motherwell, and Mr. L. R. MILLIGAN, deputy chairman of the Scottish Divisional Coal Board.

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Mr. DUDLEY E. BRAHAM, representative for G. A. Harvey & Company, Limited, engineers and metal workers, of London, S.E.7, has completed 40 years' service with the firm.

After 37 years with the company, Mr. J. W. MARTIN, director and sales manager of Whessoe, Limited, oil, gas, and chemical plant manufacturers, of Darlington, is retiring at the end of the month.

Mr. R. A. PLEACE, manager of the rubber purchasing department of the Dunlop Rubber Company, Limited, is retiring on March 31. Before joining Dunlop he was for 18 years connected with the London Rubber Market.

Mr. AMBROSE CONGREVE, chairman of Humphreys & Glasgow, Limited, contracting engineers, of London, S.W.1, is to visit principal south and central American cities during the next three weeks. He will be accompanied by Mr. D. C. LENNON, an associate director.

A guest at the annual dinner of the Doncaster and District Mines Rescue Station last week was Mr. JOHN DOUGLAS HAMMENT, superintendent of Southern Mines Rescue Station, Bellambi, New South Wales. He was taken on an underground tour of Markham Main Colliery on Thursday of last week.

Sir JULIAN PODE, managing director of the Steel Company of Wales, Limited, and deputy chairman of the Development Corporation for Wales, Limited, has been appointed chairman of the South Wales committee of Lloyds Bank, Limited, following the retirement of Mr. E. Whitley-Jones. Sir Julian has been a member of the committee since 1959.

Appointed chairman of the Yorkshire branch of the Institution of Mechanical Engineers at the annual meeting last week Mr. HARRY TOWNEND, a retired chartered engineer, is the first Sheffield chairman for a number of years. He takes a great interest in further education in the city and is a former chairman of both the Manchester and Sheffield branches of the Institute of Welding.

Mr. ANTHONY M. BROWNE, chairman and managing director of Hackbridge & Hewittic Electric Company, Limited, has been elected president of the British Electrical and Allied Manufacturers' Association. Mr. H. H. Mullens, chairman and managing director of A. Reyrolle & Company, Limited, and chairman of C. A. Parsons & Company, Limited, has been elected deputy president.

Chairman of the Chamberlain Industries, Limited, group of building construction and engineering companies, of London, S.W.1, Mr. LESLIE F. CHAMBERLAIN, accompanied by Mr. M. H. BRIGGS, a senior group director, is shortly to visit Trinidad to inspect progress on the new works being erected for Sanders & Forster (Caribbean), Limited, the group's newly-formed structural engineering subsidiary.

Area Industrial Relations Officer, No. 5 Area, East Midlands Divisional Coal Board, Mr. G. H. BOWMER has retired because of ill health after 50 years in the industry. Mr. Bowmer started work as an underground haulage worker when he was 13. Joining the staff of the Ministry of Fuel and Power as Regional Investigation Officer in 1942, he was appointed a colliery labour officer No. 4 Area, in 1946, becoming Area welfare officer, No. 5 Area, a year later. Mr. Bowmer was appointed to the post from which he retires in 1957.

Elected Fellows of the Royal Society last week were Prof. H. E. M. BARLOW, Dean of the Faculty of Engineering, and Pender Professor of Electrical Engineering and Director of Laboratories, University College, University of London; Dr. J. CHATT, Head of the Inorganic Chemistry Department, Akers Research Laboratories, Imperial Chemical Industries, Limited, Welwyn (Herts), and group manager of the Heavy Organic Chemicals Division, ICI; Dr. S. H. HAUGHTON, inter-African scientific correspondent for *Geology*, member of the Commission for Technical Co-operation in Africa, Pretoria, and former director of the Geological Survey of South Africa; and Dr. R. G. S. HUDSON, Research Fellow, Department of Geology, Trinity College, Dublin.

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## W. H. A. Robertson Medal and Premium Won by Japanese Engineers

COUNCIL of the Institute of Metals has awarded the 1960 W. H. A. Robertson Medal and Premium to Mr. Y. Yokote and Mr. S. Nomura, of the Shibaura United Engineering Company, Limited, Tokyo, for their paper on "Rolling Aluminium Foil: An Experimental Study of a Modern Mill," published in the Journal of the Institute, 1960, vol. 88, pp. 241-254.

The medal, which is the gift of W. H. A. Robertson & Company, Limited, steel mill manufacturers, etc., of Bedford, is awarded by the Council annually for the paper adjudged to be of the highest merit contributed to the Journal on engineering aspects of non-ferrous metallurgy.

# IRON AND STEEL INSTITUTE

## *Awards of Medals and Prizes*

BESSEMER Gold Medal of the Iron and Steel Institute for 1961 has been awarded to Mr. William Barr, a director and chief metallurgist of Colvilles, Limited. Mr. Emrys Davies, managing director of Brymbo Steel Works, Limited, receives the Sir Robert Hadfield Medal for 1961, and the Williams Prizes (£50 each) go to Mr. T. McHugh and Mr. F. A. Kirk, and Mr. J. Chapman and Mr. W. Montgomery. Awards of the Andrew Carnegie Medal and the Ablett Prize will be announced later.

Mr. Barr, who was educated at Hamilton Academy and the Royal College of Science and Technology, Glasgow, joined the staff of David Colville & Sons, Limited, in 1922 as a metallurgist and after the formation of Colvilles, Limited, became chief metallurgist in 1936. He was appointed to the board in 1954.

MR. W. BARR

A member of the Iron and Steel Institute since 1925, he was elected a member of Council in 1948, served as honorary treasurer from 1953 to 1959, and as president in 1959-60. He is a past president of the West of Scotland Iron and Steel Institute and founder Fellow and past president of the Institution of Metallurgists. During his long association with Colvilles he has contributed articles and technical papers to numerous societies, his activities being specially devoted to research on creep, the brittle fracture of mild steel, and the development of low-alloy high-tensile structural steels, and stainless clad steel.

### New Honorary Vice-presidents

With the reorganization and amalgamation of the separate steel companies in the Guest Keen & Nettlefolds, Limited, group last August the Guest Keen Iron & Steel Company, Limited, changed its name to G.K.N. Steel Company, Limited, and acquired, among other companies, Brymbo Steel Works, Limited. Mr. Davies joined the board of G.K.N. Steel as managing director (Brymbo Steel Works).

Mr. T. McHugh and Mr. F. A. Kirk, of Low Moor Fine Steels, Limited, Bradford (Yorks), have been awarded a Williams Prize for the paper "Some Aspects of Steel Extrusion." Their co-author, Mr. R. Cox, is not eligible for an award. Mr. Chapman, of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, and Mr. W. Montgomery, Round Oak Steel Works, Limited, gained their award for the paper "The Effect of Flow Distribution on Air Preheat in the Open-hearth Furnace."

The Institute also announces the election of two honorary vice-presidents—Dr. Howard Biers, senior consultant, the Union Carbide International Company, who has been a member of the institute since 1933 and an honorary member since 1955; and Dr. T. P. Colclough, technical adviser to the British Iron and Steel Federation.

Dr. Colclough, who joined the institute in 1921, was awarded the Bessemer Gold Medal in 1954 and delivered the seventh Hatfield Memorial Lecture the same year. He was technical adviser of the mission led by Sir Eric Coates to India in 1955—which resulted in the building of the Durgapur Steelworks by the British consortium—and he led the British steel delegation to Russia in 1956.

## *Scots Steel Firm's Diversification*

EXAMPLE of how Scottish steel firms are meeting the decline of the shipbuilding and marine engineering industries, by turning to other industries and seeking orders in other parts of the country, was provided at a demonstration of steel foundry processes held by the North British Steel Foundry, Limited, at its Balbardie Steel Works, Bathgate (West Lothian), on Tuesday. Attended by Lord Polwarth, chairman of the Scottish Council (Development and Industry) and about 100 of the firm's clients, it was part of a wider plan to extend sales in England.

Mr. G. M. Menzies, managing director, said that already the firm was "exporting" to England 40 per cent. of its output of steel castings for the rubber processing industry around Manchester. North British and its associated company, Bonnington Castings, Limited, have also achieved considerable diversification of products. Until 10 years ago they produced castings mainly for the railways, marine engineering, and the nearby mines. But this week they exhibited castings for mining machinery, steelworks plant, earth-moving vehicles, tyre moulding presses, vehicle trailers and fork-lift trucks.

North British Steel has spent more than £800,000 in the past 10 years on modernizing its plant at Bathgate, which is one of the largest jobbing steel foundries in the country.

NINETEEN MINERS at Bomarsund Colliery (Northumberland), each with over 50 years' service, were recently presented with NCB long-service certificates by colliery manager, Mr. James Dix. Only two of the miners are still working. Three of the others had worked all their lives at the pit.

*Orders Placed*

# £12,000,000 Contract for Boiler Consortium

CONSORTIUM of John Brown Land Boilers and Foster Wheeler, which was formed last month, has received its first boiler contract. It is to supply the Central Electricity Generating Board with four 350,000 kW boilers at a cost of more than £12,000,000 for the Tilbury "B" power station. The steam condensers are to be supplied by Richardsons Westgarth (Hartlepool), Limited.

The first two turbo-alternators at the plant are due for commission in 1965, and the remaining two in 1966. The generators are being supplied by the General Electric Company, Limited, at a cost of £8,000,000.

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TENDER of £67,815 for the supply of steel water pipes submitted by the South Durham Steel & Iron Company, Limited, has been accepted by the Tees Valley and Cleveland Water Board.

SERIES OF ORDERS worth more than £40,000 for machines to be installed by the National Coal Board in new coal preparation plants at Yorkshire collieries, has been secured by the Don Valley Engineering Company, Limited, Doncaster.

CONTRACT WORTH £8,500 for dealkalization-base exchange and deaeration plants, has been awarded to William Boby & Company, Limited, water treatment engineers, of Rickmansworth (Herts), by John & E. Sturge Limited, Birmingham.

UNDER A £188,000 CONTRACT, nearly 25,000 precast concrete floor and roof units are to be designed, supplied, and erected by Concrete Development Company, Limited, Iver (Bucks), for the new Fisher & Ludlow, Limited, factory at Llanelly.

NUMBER OF ORDERS has been received recently by Matterson, Limited, mechanical handling engineers, of Rochdale, for locomotive lifting jacks for British Railways. The firm's range of jacks was increased last year to include jacks of 40-ton capacity.

ALL THE FUEL injection equipment for the new tractor of the Ford Motor Company, of the US, the Ford 600, is to be supplied by Simms Motor Units, Limited, which has been supplying Ford's of Dagenham for many years. Deliveries to Detroit began towards the end of last year.

ORDERS FOR MODIFICATIONS and extensions to the "Aglite" lightweight aggregate plant at the Salterwood Works of the Butterley Company, Limited, have been received by Plowright Bros., Limited, London, S.W.7. The contracts, valued at over £100,000, include clay preparation and handling equipment, crushing, handling, and storage of the sintered product, and structural steel buildings as well as all the necessary electrical equipment and modifications.

GROUP OF UK FIRMS, consisting of Gibbons Bros. Limited, Dudley (Worcs), the materials handling division of Fisher & Ludlow, Limited, Tipton, and William Boulton, Limited, Burslem, Stoke-on-Trent, has secured a contract from the Rumanian Government worth about £500,000. The order is for a complete, near-automatic, ceramic factory to produce 6,000 tons a year of sanitary ware by the end of 1963. Delivery is expected to be made by the end of this year.

CONTRACTS placed by the Scottish Region of British Railways include one with Archibald Low & Sons, Limited, Kirkintilloch, Glasgow, for pipework and pumps for diesel maintenance facilities at Eastfield motive power depot, Glasgow. Lambhill Iron Works, Limited, Glasgow, is to build the structural steelwork for buildings at the new Millerhill marshalling yard, Edinburgh, and Steels Engineering Products, Limited, Glasgow, has received a contract for a mobile crane for the Glasgow and South-west division.

ORDERS FOR newspaper and lithographic printing machinery worth more than $3,000,000 have been received by R. W. Crabtree & Sons, Limited, Leeds, through its Toronto subsidiary, R. W. Crabtree & Sons (Canada), Limited. The order consists of "Supercolour" newspaper presses for two Canadian publishing houses, Sifton and Southam, and for the latest Crabtree litho machines for the US. For Sifton, six-unit, high-speed presses will be installed at Regina and Saskatoon, and for Southam a 12-unit press will be installed at Calgary.

BROOKHIRST IGRANIC, LIMITED, a company in the Metal Industries, Limited, group, has received an order to supply control equipment for a new factory which has been engineered by W. J. Fraser & Company, Limited, Romford, and which is being erected by South African Titan Products, Limited, in Umbogintwini. The factory is scheduled to produce titanium dioxide. Brookhirst Igranic's Chester unit is supplying seven Chester Major boards and the Bedford unit is responsible for the supply of two 3.3 kW high tension boards. The assembly of the control equipment is being undertaken by Brookhirst Igranic S.A. (Pty.), Limited.

AN ORDER from Birlec-Efco (Melting), Limited, Aldridge (Staffs), covering two 35-mVA arc-furnace transformers to be installed at the Tinsley Park Works of the English Steel Corporation, Limited, Sheffield, has been received by the transformer division of Associated Electrical Industries, Limited. The transformers will be designed and manufactured at the AEI Rugby Works. Each will supply power to a Birlefco arc furnace of 100-ton capacity, with a 22-ft. diameter shell, rotatable about its vertical axis through an angle of 30 deg. on either side of its mean position. The shell bottom will be of non-magnetic steel in order to permit the use of a stirrer of the electromagnetic type.

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# *Qualcast Board to be Reorganized*

REORGANIZATION of the board of Qualcast, Limited, ironfounders and lawn mower manufacturers, of Derby, will take effect on April 1, when the company will operate its main foundries at Derby as a sub-group under its own management board. Mr. A. J. Batterham, a departmental director and general manager of the Wolverhampton branch of the company, will head the new sub-group.

Mr. V. Jobson, who is 74, and who has been with Qualcast for 56 years, will continue as chairman, with Mr. J. R. Fleming as vice-chairman. At present Mr. Fleming is also joint assistant managing director, specializing in production, but he is to retire at the end of the year, although he will remain a consultant director.

Mr. T. W. Cooper, joint assistant managing director, becomes sole managing director on April 1. The executive directors will be:—Mr. E. J. Appleby, in charge of financial and secretarial matters; Mr. H. Clarke, in charge of finished products; Mr. H. A. Redshaw, in charge of group foundries; and Mr. R. H. Harris (a new appointment to the parent board) in charge of castings sales.

# *ICI Fuel Switch*

## LOSS TO DURHAM NCB OF 500,000 TONS OF COKING COAL

DURHAM miners' fears that 1,250,000 tons of coal a year supplied by the coalfield to the Billingham and Wilton plants of Imperial Chemical Industries, Limited, would be lost as a market as the result of a change to oil in ICI's fuel policy were partly allayed by a statement by the Durham Division Coal Board on Tuesday, which said that ICI's annual demand for steam-raising coal at the two plants would not be affected by any projected change in its fuel plans.

The statement said that the demand from ICI for steam-raising coal was at present 1,250,000 tons a year, and that this would not be affected. But the company's coke ovens were nearing the end of their useful life and would not be rebuilt. In consequence, the 500,000 tons of coking coal taken annually by the company would not be required from about the beginning of next year.

The board said that for some time this coking coal would be replaced by NCB coke, but added: "It is true that this process will be replaced by one using oil." The board declined to comment on how the reduced demand would affect the Durham miners. Mr. Sam Watson, secretary of the Durham Area of the National Union of Mineworkers, had earlier said that as many as 5,000 miners might be affected, but his remarks appeared to be based on the rumour that 1,250,000 tons of coal were to be lost.

## First Welsh Group Scheme for Training Apprentices

FIRST group apprentice scheme of its kind in Wales was officially launched at Treforest (Glam), on Wednesday. Organized through the Industrial Association of Wales and Monmouthshire, it is intended to give wider training opportunities to apprentices in small factories and provide more skilled men. Mr. B. M. Evans, controller for Wales of the Ministry of Labour, described it as a landmark in the history of Welsh industrial training.

Mr. L. G. Oxford, chairman of the scheme committee, said the security of industry in Wales would depend largely on the available skilled labour, and they had to face up to the dire necessity of training and taking in more apprentices. Under the scheme, apprentices are able to study processes and practices at other works by an exchange system. One of the points of agreement is that there shall be no "poaching" of promising apprentices.

## MP WANTS PIT REOPENED

EFFORTS to reopen a small mine at Nenthead, near Alston (Cumberland), under licence from the National Coal Board, have the backing of Mr. Rupert Speir, MP for Hexham. The board has refused the licence on the grounds that two drift mines in the same area are already to be reopened

Mr. Speir claims that opening the Nenthead pit would increase output of anthracite coals and give work to 15 to 20 miners in a depressed area. He is in touch with the Minister of Power on the question.

## Smokeless Fuel Plant May be Built in Scotland

PLANS are being made to produce large new sources of solid smokeless fuels to meet the needs of the growing clean air zones. Mr. John C. George, Parliamentary Secretary to the Ministry of Power, outlined some of them at a conference in Glasgow last Friday of 19 West of Scotland local authorities. A national campaign to win public support for smoke control was launched at the same time.

The National Coal Board, said Mr. George, was making a thorough examination of the types of Scottish coal suitable for processing, and the National Carbonising Company, Limited, was considering setting up a plant in Scotland if there was a strong enough demand. The proposed plant would be at Falkirk, could be built in six months, and would have an initial output of 40,000 tons, building up to 100,000 tons.

Because coke would play an important part in keeping air clean, the Gas Board was concentrating on a new British standardized coke, substantially better than ordinary gas coke. The difficulty again was forecasting demand. In 1959, local authorities told the Secretary of State they expected 60,000 tons would be needed that year, and 400,000 tons by 1965. In fact, only 49,000 tons were being used, and probably less than 100,000 tons would be required this year.

Mr. Thomas Galbraith, Joint Parliamentary Under-Secretary of State for Scotland, said that by 1963 nearly all industrial furnaces would be equipped to eliminate smoke. Colvilles, Limited, alone by that date might well have spent £6,000,000 on smoke elimination.

## *Coal Mining and Methodism*

CHURCH and mining industry conference is to be held at the end of May for every Methodist minister, deaconess, and lay pastor in the coal-mining areas of Sheffield Methodist District. Its aim will be to re-establish Methodism's traditional relationship with the mining communities.

The Rev. George Percival, district chairman, said that Methodism, through its outstanding Christian miners, did more than any other religious movement to bring about the present wellbeing of the mining communities. "Today," he went on, "we have to overcome the changed attitude which regards the church as irrelevant and with not a little suspicion."

# Three Aims for RTB's Spencer Steelworks

NEW Spencer Steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon), aims not only to produce very high quality steel, but also to deliver it on time.

"This might seem the obvious thing to do, but it has not been so obvious in the steel industry during the last 15 or 16 years," said the firm's general manager, Mr. W. O. Campbell Adamson.

MR. W. O. C. ADAMSON

Speaking at the annual dinner of the Pontypool Chamber of Trade on Thursday of last week, Mr. Adamson said that since the war there had always been far greater demand than supply in the flat roll trade. As a result steelmakers had tended to become careless and accept delivery dates which they could not fulfil. At the new works, however, they intended to operate in such a way that they would not disappoint the customers and would deliver orders on time. Computers and the latest automation equipment would enable them to know the exact stage of any order in the works much more quickly than by the previous manual methods.

"We have now got all the senior managers and they are all from a large number of iron and steel plants around the country," he continued. "We are all spending our time trying to train ourselves to operate the plant efficiently when the time comes."

Mr. Adamson went on to say that another aim of the works was to be a good neighbour. "We have not started awfully well with the shale lorries, but when we settle down and start operations next year we hope to be good neighbours in the industrial and social sense to the areas around us."

The third chief aim was to use 1961 not 1861 methods in labour relations and recognize that everyone who entered the works had something to offer it and was entitled to have his opinions heard. "I would like to pay a tribute to the trades unions," he said. "We have met all those with whom we shall have to deal and in every case have been delighted at their modern outlook." Most of the management were fairly young, and this would give the works excitement and enthusiasm, which should be good for it. He hoped they would be able to keep up the freshness, enthusiasm, and seeking after new ideas in the years ahead.

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DUE TO A combination of circumstances the Belfast shipyard of Harland & Wolff, Limited, is faced with a substantial redundancy. Last Friday, Dr. Denis Rebbeck, deputy managing director, said that the present labour force of about 20,000 would have to be reduced by about one third. He emphasized that the yard still had important shipbuilding work to do, but it looked as if conditions in the shipbuilding industry were not likely to improve during 1961. Meanwhile every effort was being made to diversify the company's activities.

## *Appointments*

MICHIGAN (G.B.), LIMITED, has appointed Mr. Harry C. Lee as general spares and service manager for its Camberley (Surrey) works.

Dr. M. G. BOWN, of Clare College, Cambridge, has been appointed a university lecturer in the Department of Mineralogy and Petrology.

Mr. J. F. GEORGE has been appointed marketing manager for Thomas Potterton, Limited, heating appliance manufacturers, of London, S.W.18.

RYLANDS BROTHERS, LIMITED, makers of wire and wire products, of Warrington, has appointed Lt.-Col. D. Burnett as employment and training officer in succession to the late Cmndr. C. F. Alsbury.

Mr. CLIFF MEREDITH has been appointed plant hire manager of Plant Hire Service (London), Limited, London, S.W.11. He was formerly with Samuel Williams & Sons, Limited, engineering contractors, of London, E.C.3.

Mr. V. J. ROSS has been appointed assistant regional manager, Scotland, for British Insulated Callender's Cables, Limited. He was formerly sales manager for Scotland of Scottish Cables, Limited, a wholly-owned subsidiary of BICC.

Mr. PETER J. WRIGHT has joined the marketing division of Massey-Ferguson (United Kingdom), Limited, Coventry, as general sales manager. He will be responsible to Mr. L. H. Pomeroy, director of marketing, for the supervision and control of sales activities, etc.

Mr. J. LEWIN, formerly a senior assistant engineer with the Metropolitan Water Board, has been appointed materials handling engineer responsible for the development of mechanical handling techniques within the BTR Industries, Limited, group, thermoplastic and rubber manufacturers, of London, S.W.1.

Mr. R. G. SMITH has been appointed commercial manager of Appleby-Frodingham Steel Company, a branch of the United Steel Companies, Limited. Mr. C. R. BENNETT is appointed sales manager (heavy products) and Mr. I. E. STEWART becomes sales manager (light products). Mr. C. A. GRIFFIN is appointed raw materials officer and Mr. I. W. PETTINGER will succeed Mr. L. Jackson as head of quotation section (heavy products) on the latter's retirement in June.

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## *Slight Fall in 1960 Export of Bronze and Brass Ingot*

AT the annual meeting of the British Bronze and Brass Ingot Manufacturers' Association on Tuesday, Mr. James H. Barwell, president, said that the export of ingots had continued at a good rate after falling off in the third quarter of last year, although the 1960 total overall was slightly lower at 29,422 tons. A general shortage of scrap in the UK, however, with consequent high prices, made it evident that the country could not afford to export scrap.

Mr. Barwell said it seemed clear that prices of metals and scrap in many countries were still subject to political and fiscal policy influences, and to open our doors to scrap exports would submit us to unfair competition. The Board of Trade continued to weigh the scrap exports problem very carefully. The Government had announced it was prepared to consider applications for the export of scrap from shipbreakers, but there was a very strict procedure, and little or nothing had been exported from that source.

Mr. Barwell, who is joint managing director of Allcock & Company (Metals), Limited, was re-elected president, and Mr. J. N. Cohen, of A. Cohen & Company, Limited, was re-elected vice-president.

# GRANULATION of LIQUID IRON

## Stewarts and Lloyds' Process

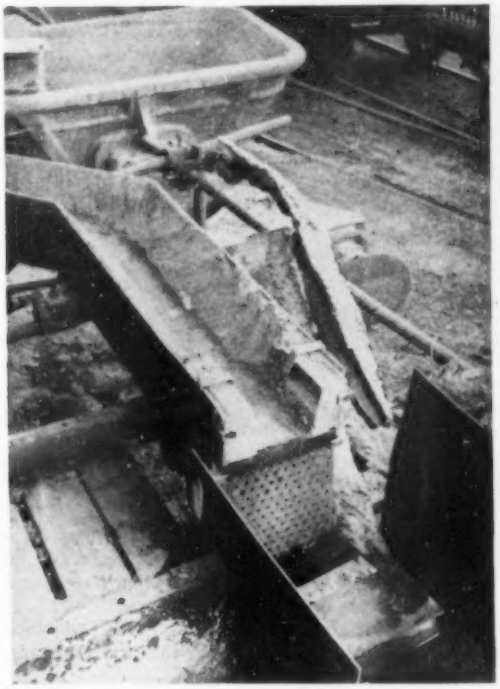


FIG. 1.—EXPERIMENTAL MODEL SHOWING RIBBON MAKER AND WATER-SPRAYING HEAD.

*by H. E. STORR and T. RUDKIN*

**A short article on a new plant for the granulation of liquid iron appeared in our December 16, 1960, issue (p. 1319). A full report of the liquid iron granulating process, which was developed and patented by Stewarts and Lloyds, Limited, is given below. Mr. Storr is works manager of the Wellingboro' Iron Company, Limited. Mr. Rudkin is a director of John Miles & Partners (London), Limited, licensees of the process.**

IF the product of the blast furnace is not to be used in the liquid state then the long-established practice of casting it into pigs in sand beds is a simple way of dealing with it. Its main advantage is that little capital equipment is required and its disadvantages are the large space requirement, heavy labour involved in removal, and that sand adheres to the iron—this latter being disadvantageous for basic open-hearth steelmaking. It is thus not surprising that machine pig-casting has been adopted on a wide scale, even though it requires considerable expenditure and maintenance.

The idea of granulating liquid iron by pouring it into water is not new and would appear to require simple equipment. However, until recent years there has been little done to put the idea into practice. This is because of the explosion hazard in treating liquid iron with water and the need to provide a convenient means for removing the granulated product if the idea is to be really attractive. A plant which granulates liquid iron by a water-quenching device has been operated at Watenstadt in Germany.

In this device the liquid iron is poured via a runner on to the centre of a fixed circular distribution plate made of rammed refractory and having notches in its rimmed perimeter. The liquid iron on flowing through these notches falls on to a steel cone copiously irrigated with water and revolving at 180 r.p.m. The iron breaks up into droplets which fall into a trough of water

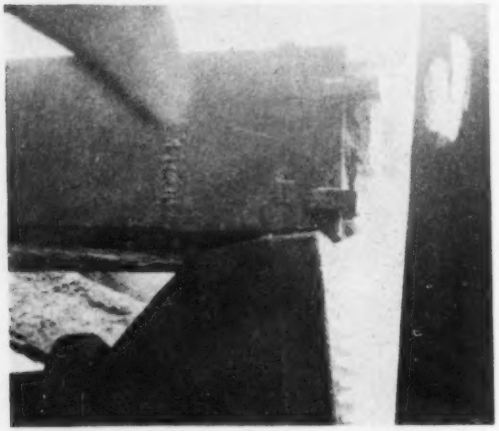


FIG. 2.—EXPERIMENTAL MODEL IN ACTION. CLOSE-UP OF RIBBON OF METAL AND WATER SPRAYS.

and are extracted from the bottom of this on a metallic grating serving as a drainer. The output rate per unit is ½ ton/min., the plant at Watenstadt having two units.

The granules are found to be superior to block pig-iron for charging back to the blast furnace, the coke rate for remelting being some 40 per cent. less than with pig-iron.

### Granulation of Liquid Iron at Wellingborough

The granulation of liquid iron attracted serious consideration at the Wellingborough Works of Stewarts and Lloyds because some of the pig-iron produced there is sent to the Corby Works, about 18 miles away, for re-charging to the blast furnaces, converters, desiliconizing vessel, or open-hearth furnaces, as occasion demands.

At the time of writing the granulated iron is being used in the open-hearth and desiliconizing plants only. At first the iron for Corby was sent in the form of machine-cast pigs and it was found that considerable wear and tear occurred on the transporting equipment and blast-furnace charging equipment, top gear, and lining. It was felt that iron in granular form might reduce such wear and tear.

After studying the existing granulation methods, which were not favoured because of mechanical moving parts, it was decided to attempt the granulation of liquid iron by water in a simpler way and model experiments were planned. Having regard to the normal explosive action of liquid iron in contact with water it seemed logical to let nature do all the work of breaking up a stream of liquid iron and concentrate efforts on providing conditions that would allow full control of the action between the iron and the water.

From the start it was decided to aim for a continuously operating process, but the first experiments were made to ascertain that a thin band of liquid iron could be formed and maintained over long periods and be granulated by jets of water. The first attempt, made in August, 1953, was very encouraging.

The experimental rig is shown in Figs. 1 and 2. It consisted essentially of an inclined channel for the liquid iron and a spraying head below the end of the channel. Water was supplied from the existing pig-casting plant pumps at a pressure of 28 lb./sq. in. and temperature of 95 deg. F. Iron poured from a ladle produced a thin stream as it flowed over the end of the channel, this latter being rounded and of silica brick. The spraying head produced numerous jets from holes of varying sizes and the falling stream of liquid iron was granulated successfully though to a rather small size.

A few trials with this rig showed that it was

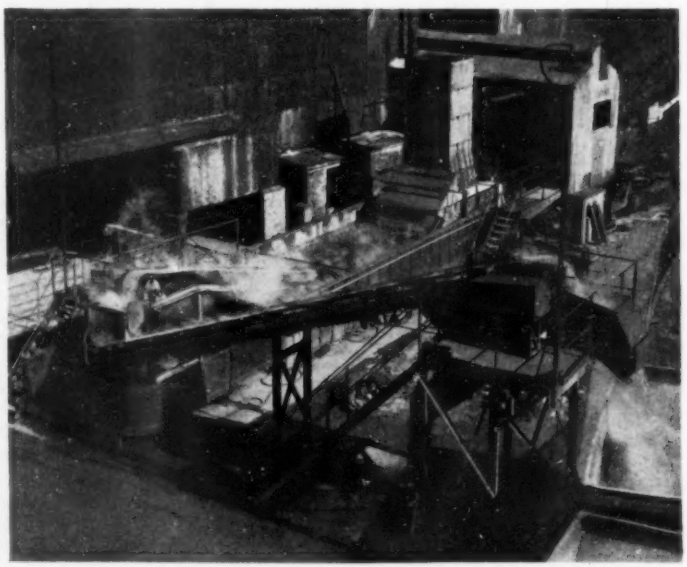


FIG. 3.—GENERAL VIEW OF THE PROTOTYPE GRANULATION PLANT AT THE WORKS OF THE WELLINGBORO' IRON COMPANY, LIMITED. THIS WAS INSTALLED IN 1954 AND HAS A CAPACITY OF 2 TON/MIN. THE GRANULES ARE EXTRACTED ON A PRIMARY CONVEYOR AND DELIVERED TO A WAGON VIA A SECONDARY CONVEYOR.

impossible to run the apparatus for more than two or three minutes because the receiving receptacle, being of small capacity, filled up quickly with iron granules and water and was soon overfilled with the granules, leaving no room for water. Consequently, the granules were not cooled sufficiently to prevent agglomeration and difficulty in removal. Nevertheless, the principle of granulation had been demonstrated and the next step was to introduce means for continuity of production.

The main modifications to the experimental model were the provision of a water tank and belt conveyor to receive the granules. At this point it should be noted that the model was built from various pieces of redundant plant, which, though not perhaps just as envisaged, enabled the experiments to start without delay.

The feasibility of continuous operation was soon evident and it then remained to ensure regularity of the iron ribbon, to determine the optimum water pressure and flow rate and overcome difficulties relating to the collecting and belt conveying of the granules.

As the belt operates under severe conditions special consideration was given to its quality. The use of a heat-resisting rubber in a three-five stepped-ply formation was developed and very satisfactory results were obtained.

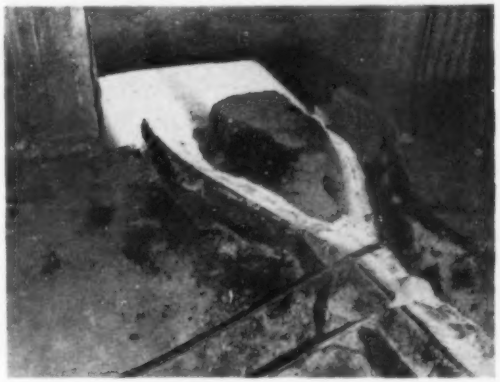


FIG. 5.—VIEW OF BIFURCATED RUNNER SHOWING TWO RIBBONS OF LIQUID IRON.

Owing to the high bulk density of the granules it was also found necessary for the conveyor belt to have more idler rollers than are normally used: the extra rollers also keep the water to the centre of the belt as it rises above the water level and in this way cools the granules still more.

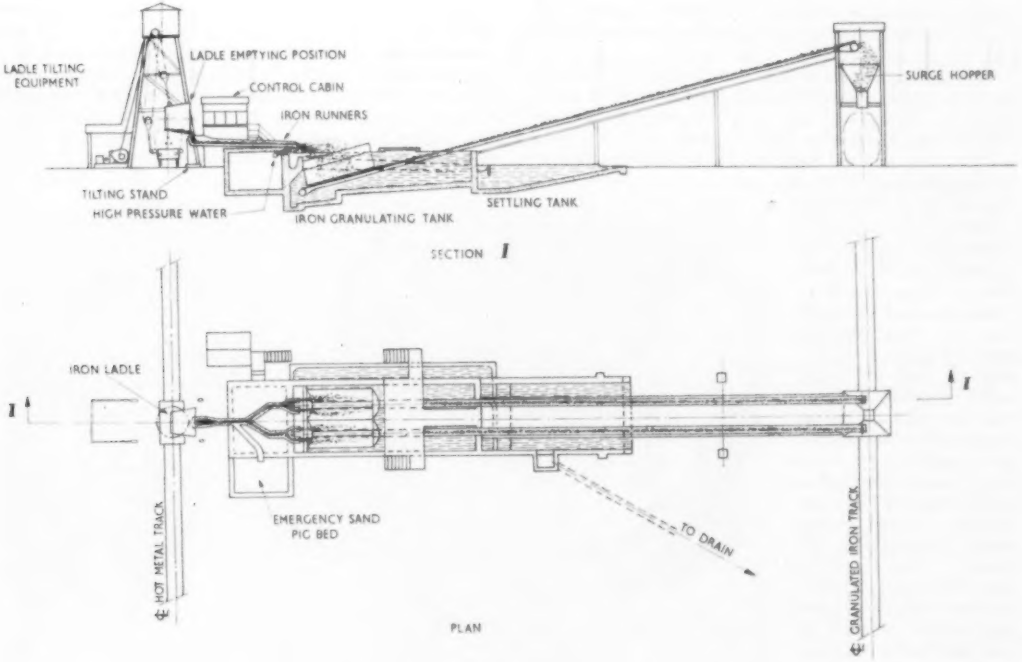



FIG. 4.—SCHEMATIC DIAGRAM OF A TYPICAL 4-TON/MIN. GRANULATION PLANT DELIVERING FROM PRIMARY CONVEYOR TO RAIL WAGONS.

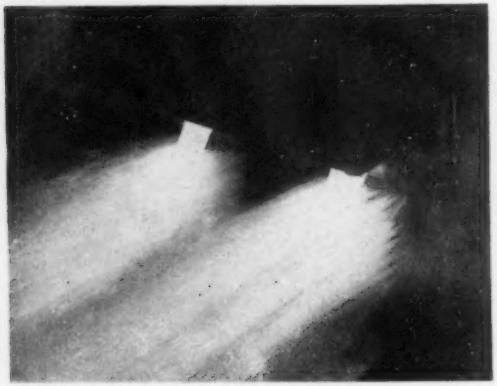


FIG. 6.—RIBBONS OF LIQUID IRON RUNNING INTO WATER JETS AT THE WELLINGBOROUGH PLANT.

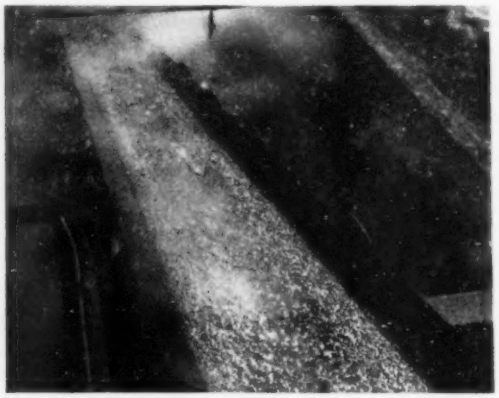


FIG. 7.—GRANULATED IRON EMERGING ON CONVEYOR BELT FROM THE COLLECTING TANK.

By the end of 1953 it was evident that the process could operate on a production basis, several runs of complete ladles of iron (20 to 25 tons) having been granulated in 30 to 40 min. The model plant was kept in frequent use until May, 1954, by which time enough data had been accumulated to design a plant of 2 ton/min. capacity. Authority and capital for such a plant were granted on August 5, 1954, and 13 weeks later, the prototype plant, constructed by the works engineering department, made its first run.

This plant, which is the one in use at Wellingborough today, has operated with complete satisfaction. The total of iron granulated to date (December 28, 1960) is 766,577 tons.

Fig. 3 is a general view of the prototype plant at Wellingborough and Fig. 4 is a schematic diagram of a typical granulation plant with a capacity of 4 ton/min.

The normal throughput of the Wellingborough plant is 2 ton/min. in two channels, each channel taking iron at the rate of 1 ton/min. The ladles are tipped by an overhead crane, which gives good control of the pouring speed, this being indicated by the primary belt amperage, and also of the locating of the ladle pouring lip. A view of the bifurcated runner dividing the liquid iron into two ribbons is shown in Fig. 5.

Each ribbon of iron falls downwards across a head containing a group of water jets directed upwards at an angle to the horizontal. The quantity of water required is dependent on the temperature of the iron to be granulated, the analysis of the iron, and the temperature of the water.

Fig. 6 shows the ribbons of liquid iron running into the groups of water jets. The conveyor with its load of granulated iron just after emerging from the water in the collecting tank is shown in Fig. 7.

As the metal cascades away from the blocks it is met first by the smaller jets, roughly at right-angles. They cool it fractionally and impart a slight forward motion, thereby starting the breaking-up operation. The lower jets, which are larger, break up the stream completely and, while so doing, solidify or

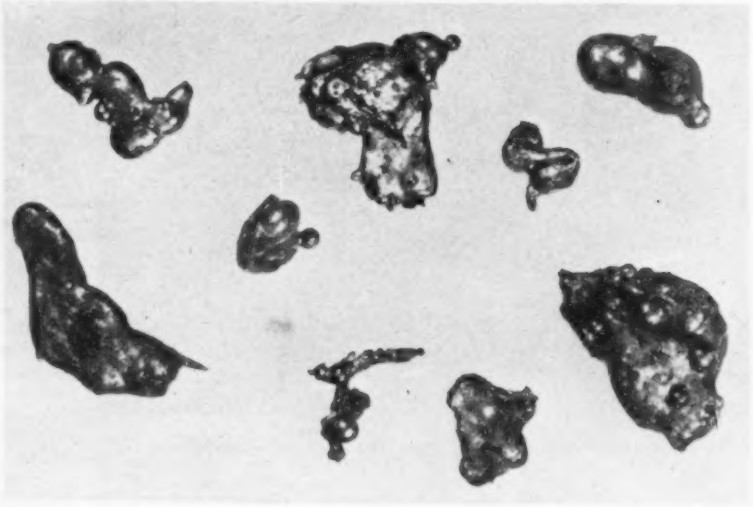


FIG. 8.—ACTUAL-SIZE PHOTOGRAPH OF A TYPICAL SAMPLE OF GRANULES.

FIG. 9.—DISCHARGING END OF PLANT FOR GRANULATING LIQUID IRON AT PORT TALBOT.

FIG. 10.—POURING IRON INTO THE MAIN CHANNEL AT THE GRANULATION PLANT OF S.A. DE ESPÉRANCE-LONGDOZ.

"freeze" the metal particles—as well as spreading them in a horizontal plane of about 140 sq. ft.

Below the resultant shower of solidified red hot pellets is a specially shaped and louvred cooling hopper, immersed in water, with a running seal between its base and the 30-in. wide primary collecting belt underneath. As the metal particles strike the surface of the water they lose their forward motion and sink gently down through the water into the hopper. The primary conveyor belt withdraws the granulated iron from below water-level continuously and transfers it via a chute to a second belt which then conveys it to railway wagons or motor transport as the case may be.

From the moment the molten iron leaves the lip of the ladle only 45 sec. elapse before it is loaded in a cool, granulated form ready for despatch. Fig. 8 is an actual-size photograph of a typical sample of granules produced at Wellingborough. It may be that with further experimentation, larger granules can be obtained.

### Granulation Plant of the Steel Company of Wales, Limited, Port Talbot

This plant, which came into operation in June, 1959, has a nominal capacity of 4 ton/min., having four ribbons of metal each treated by a group of jets. The water-flow rate and pressure are approximately the same as at the Wellingborough plant. The liquid iron is delivered in 140-ton torpedo ladles which have their own tilting device incorporated on the ladle carriage.

Fig. 9 is a view of the Port Talbot granulation plant, showing the two primary conveyors which deliver the granules on to one swivelling stocking conveyor. The product from this plant is used in the blast furnaces and also in the open-hearth furnaces.

FIG. 11.—FOUR RIBBONS OF LIQUID IRON RUNNING INTO THE WATER JETS AT THE GRANULATION PLANT OF S.A. DE ESPÉRANCE-LONGDOZ.

### Granulation Plant of S. A. de Wendel et Cie, Joeuf, France

This plant represents a partial adaptation of the Stewarts and Lloyds' process, the design used being dictated by the small space available. No ladle is used, the casting and granulating being done direct from the blast-furnace taphole.

As it is not possible to control the flow of iron from the taphole, an escape runner is provided so that the iron in excess of 2 ton/min. can be run into a ladle. The granulated iron falls from the high-pressure water jets into a con-

crete tank, which was already available on this site. This tank is full of water and when the temperature of the water reaches about 85 deg. C., the granulating is stopped, the water is drained from the tank, and the granules are extracted by electromagnet. The granulated iron is charged into the blast furnaces.

### Granulation Plant S. A. de Espérance-Longdoz, at Seraing, Belgium

This plant was started up in August, 1960. It has a nominal throughput rate of 4 ton/min. by means of four ribbons and groups of water jets: actual throughput rate averages 5 ton/min. Figs. 10 and 11 show this plant in operation.

An adequate supply of water is available at Espérance-Longdoz and, as the temperature of the water in the collecting tank increases, additional water is supplied into the tank. Normally, the granulated iron is carried on the two primary conveyors and then on to the secondary conveyor for delivery into the transfer car on top of the blast-furnace stock bins. If these stock bins are full or if the transfer car is in use, the product can be taken off the secondary conveyor halfway along its length and delivered into either railway or road wagons as required.

The provision for the granulation of liquid iron has proved particularly valuable at weekends and other occasions when the steelmaking plant cannot absorb the whole of the liquid iron make. This is because granulated iron can be readily re-charged into the blast furnace without damage to equipment. Furthermore, it does not disturb the working of the furnace; on the contrary, it tends to smoother working.

### Planned Installations

Two more granulation plants have been ordered. One for a capacity of 4 ton/min. by S.A. de Wendel et Cie for its Hayange works and the other by the S.A. Cockerill-Ougrée in Belgium to deal with 6 ton/min.

### Comparison of Granulated Iron with Machine-cast Pig-iron

The advantages of granulated iron over machine-cast pig-iron are as follow:—

(1) Less ground area is required for the installation.

(2) The cost of the installation is approximately 60 per cent. lower than that of a standard pig-casting machine.

(3) The amount of fuel for re-melting in the blast furnace is much lower.

(4) Wear and tear on the transporting equipment and blast-furnace charging equipment is considerably reduced.

(5) The material is easier to handle mechanically.

(6) The granules will pass through the blast-furnace stock bins without any difficulty.

(7) The granules can be added to the ladle for temperature control during desiliconizing, or to the converter or steelmaking processes.

(8) The maintenance on the plant is much less.

(9) The cost of producing granulated iron is approximately a third of that for producing machine-cast pig-iron.

(10) The material can be stocked without difficulty.

The disadvantages which one would expect when using iron in granulated form instead of in pig-form are as follow:—

(1) Spilled granules are more troublesome to recover unless, of course, the layouts are properly designed to handle granulated iron.

(2) Granules hold more moisture; the amount depends to a great extent on the design of granulating plant and the "know-how" of granulation.

However, the considerable experience now gained in handling and using granular iron at the four existing plants has shown that these disadvantages have been readily overcome.

## *ISI Special Meeting in US and Canada*

FULL details of the special meeting of the Iron and Steel Institute to be held in the United States and Canada in October and November are now available. The meeting has been arranged at the invitation of the Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers. The American Society for Metals has also invited members and their ladies to attend its annual congress and banquet and the Metals Exposition at Detroit and to visit the society's new headquarters at Novelty Park, near Cleveland, Ohio.

Invitations to visit their works have been received from many companies in the iron and steel industry and from other metallurgical companies and organizations in the US and Canada. There will also be a number of social functions during the meeting.

Full details of the programme and information concerning travelling may be obtained from the Secretary, Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1. Preliminary registration forms should be returned as soon as possible, and not later than April 17.

### Disposable Industrial Respirators

The Sanoid S1181 disposable industrial respirator, described in our last issue (p. 580), is manufactured by Coxson, Gerrard & Company, Limited, Fountain Lane, Oldbury, Birmingham.

*In this paper, presented to the Midland Branch of the National Association of Colliery Managers on February 15, 1960, the author describes the development and subsequent trials of the Mawco loader in the High Hazel Seam, Whitwell Colliery. The Mawco loader, essentially a conversion unit for the Anderton shearer loader, has been designed to improve the percentage of large coal by replacing the shearer drum with a frame jib. Sizing tests are given which show that the new unit is capable of producing coal of a size almost equal to that obtained by hand-got methods.*

# *Development of the Mawco Cutter Loader*

# Trials in the East Midlands

By N. SIDDALL, B.Eng., M.I.Min.E.*

CONFERENCE on large coal production, held at the Caxton Hall, London, during December, 1957, stressed the need for an intensive drive towards the increase in large coal production, at the same time maintaining the National Coal Board's policy of increasing mechanization to the fullest extent.

The principle of the Anderton shearer loader has been widely accepted as providing, in a simple form, a machine capable of producing a high tonnage per shift, particularly in the medium and thinner seams; but, unfortunately, a large percentage of the coal thus produced is less than 2 in., and it became obvious that this type of machine must be restricted in its application unless the sizing of the product could be improved.

### Improving the Product

In consequence, over the past two years, much thought has been given to the problem of improving the product from the Anderton shearer machine, which is so attractive from all other aspects. Many alterations and modifications to the original drum design have been tried with varying degrees of success.

These generally aimed at reducing the number of picks and, in conjunction with alteration to the plough design, at reducing the recirculation and degradation of the coal.

Apart from one or two successes, the benefits obtained from such modifications were only slight and generally not sufficient to make the machine attractive from the point of view of large coal production, and it became evident that the desired results would only be obtained by redesigning completely the coal-winning portion of the machine.

One of the first of these developments came from the No. 4 Area of East Midlands Divisional Coal Board in the form of the lump shearer and a subsequent one came from the No. 3 Area of the South-Western Division and is now being developed by the board's Central Engineering Establishment. This machine is called the Dranyam cutter loader, or, as it is probably better known, the vertical drum shearer.

The problem of converting the shearer was studied by the mechanization department of the No. 1 Area, East Midlands Division, bearing in mind that the objectives were:—

(1) To produce a machine which would give a product comparable with that from hand-filled faces.

(2) To convert the existing Anderton shearer loaders at a reasonable cost.

(3) The modifications to the machine would not necessitate substantial alterations to the timbering systems that had proved so successful with the Anderton shearer.

(4) The machine should have a bulk output comparable with that of the Anderton shearer.

The result was the Mawco cutter loader, in which the pick drum of the Anderton shearer loader is replaced by a frame jib and a redesigned plough employed to load the coal. The support system

* Area General Manager, No. 1 Area, East Midlands Divisional Coal Board.

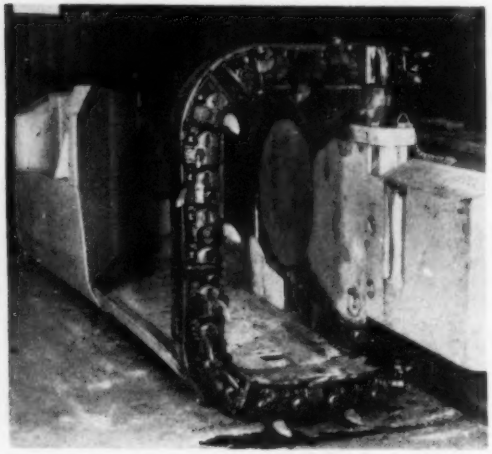


FIG. 1.—FRAME JIB OF THE MAWCO CUTTER LOADER.

and face methods used are exactly the same as those used on shearer faces, this being considered an advantage since the working of these faces is fairly common practice and training is thus minimized.

The construction of the frame jib and a suitable cutter chain able to bend in two planes called for some specialized design, and Austin Hoy & Company, Limited, Saunderton, High Wycombe (Bucks), was asked to manufacture the prototype unit.

### Construction of the Mawco Cutter Loader

As already stated, the Mawco consists of the main body of an Anderton shearer loader, the drum being replaced by a frame cutter jib (Fig. 1). The horizontal drum shaft is shortened and a chain drive sprocket fitted, this sprocket being in the vertical plane alongside the machine. The frame jib is supported on a jib post secured to the side of the machine gearhead, and the jib is arranged to slide on this post under the control of screws which provide a means of tensioning the chain. The jib itself is a continuous track for the chain from the sprocket into and around the profile of the cut and back to the sprocket. As the chain travels along the leading edge of this track it makes a horizontal roof cut, a vertical back cut, and a horizontal floor cut, thus completely cutting out a block of coal of seam height, less the thickness of the kerf at the top and the bottom.

A ball-joint chain is used and this is flexible in two planes so that the horizontal and vertical bends in the track can be negotiated. For the prototype unit a "Magnacut" chain was modified by machining the sprocket tooth engagement on the side instead of the base of the box. The change of direction of the track between the horizontal and vertical sections is a bend in the vertical plane of 7-in. pitch line radius, the outside clearance pick at this point forming a fillet with a radius of 10 in. at the roof and floor. The top fillet offers some support to the roof and has proved in practice to assist in the control of weak roof. Both the top and bottom fillets are cut out by the jib when the following web is cut and loaded.

The frame jib is constructed in a manner which enables the upper section of the track to be lowered so that the machine can be flitted back when convergence has taken place. To achieve this, a triangular support plate, attached to the upper inclined section of chain track, and a section of the vertical track are removed.

A horizontal cutter bar, equipped with picks, can be fitted on the axis of the chain drive sprocket. This rotates at the same speed as the sprocket and serves to break the lump of cut coal transversely if loading conditions require it. It is normally midway between the horizontal roof cut and the floor cut and 3 ft. behind the cutting plane of the jib. In this position it operates in the block of coal which has been cut by the frame jib, and therefore its duty is less arduous than would be expected if it were cutting in solid coal. The cutter bar can be varied in length to suit conditions; a circular plate is attached to the sprocket and this acts as a support for the chain around the sprocket in addition to guarding against the cut coal coming into contact with the cutter boxes at this point. The cut coal passes through the frame jib in a continuous block—or blocks if the cutter bar is used—and is supported by a flat plate along which it slides from the jib into the plough (Fig. 2). The plough is arranged to deflect the coal on to the conveyor behind the machine and, in so doing, induces fractures in the block of coal, thus providing lumps which can be conveyed without trouble.

### Details of the Plough

The plough travels on skids, which give a clearance under the plough base; this allows a carpet

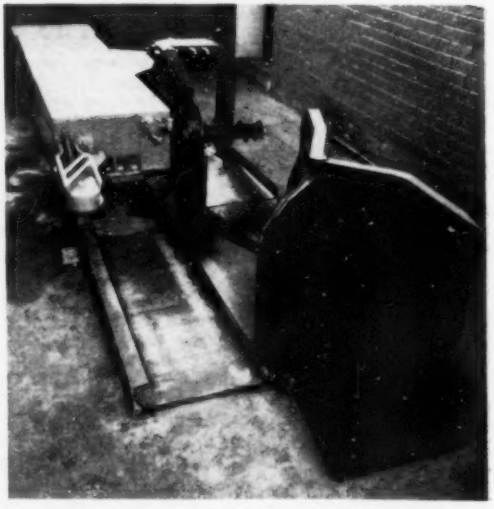


FIG. 2.—PLOUGH IN POSITION FOR LOADING.

of gummings to be left on the floor, the remainder of the gummings being conveyed by the chain until they reach the sprocket, where they are thrown clear behind the machine on to the conveyor. The gummings left on the floor are collected by a hinged blade on the plough (Fig. 3) and loaded on to the conveyor during the flitting operation. This method reduces to a minimum the circulation of the gummings, and as the plough efficiently cleans the track on the return run, it is not necessary for men to work on the face side of the conveyor. The plough and the machine underframe are articulated so that undulations of the working floor can be easily negotiated.

The underframe is the same as that used with the Anderton shearer machines, and packing pieces are used to vary the height of the machine to suit the required height of cut. Generally, the sprocket shaft is positioned centrally between the roof and floor. A fender is attached to the underframe to maintain the machine at the necessary distance from the coal face—this fender is above the height of the coal fillet at the bottom of the working seam (Fig. 4).

The prototype frame jib was fitted to an Eickhoff shearer machine, Type S IV; this machine has an 82.5-h.p. water-cooled motor and a hydraulic haulage giving variable speeds in either direction of up to 14 ft./min. Standard ratios were used to provide a chain sprocket shaft speed of 107 r.p.m., with a resulting chain speed of 473 ft./min. The existing drum shaft was modified to suit the chain sprocket and the gearhead casting drilled and tapped for attaching the jib post. The holes in the underframe had to be redrilled so that the machine centre line corresponded with the centre line of

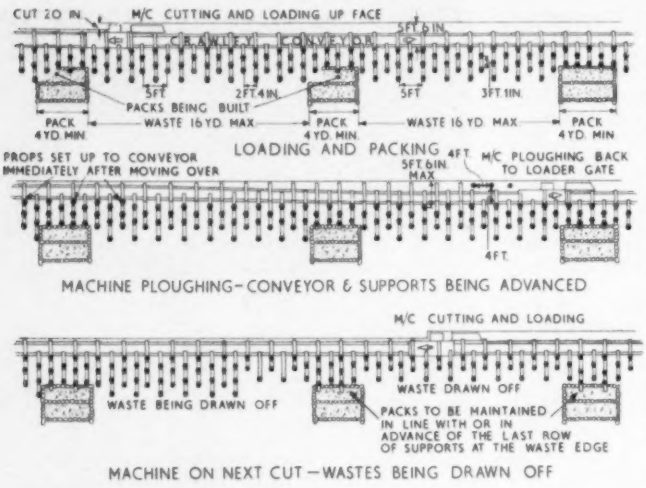
FIG. 3.—PLOUGH IN POSITION FOR FLITTING BACK, WITH HINGED DOOR MOVED BACK AND ROOF TRIMMER BLADE MOUNTED ON PLOUGH.

FIG. 4.—FENDER TO BE KEPT IN CONTACT WITH THE SOLID COAL TO MAINTAIN THE MACHINE AT THE NECESSARY DISTANCE FROM THE FACE.

the underframe, and both guide plates on the face side of the underframe were modified to form a towing link for the plough and the fender referred to previously. These modifications were carried out in the mechanization department workshops, as was the manufacture of the plough, carrying plate, and cover plate enclosing the jib post and the support plates for the frame. The latter provides a streamlined face with no projections liable to obstruct the passage of coal.

The size of the prototype frame is 40 in. high, giving a maximum depth of cut of 23 in.; the modified Magnacut chain gives a kerf width of 6 in., having eight cutting positions or lines. The upper part of the frame can be lowered when the machine is flitted back to the loader gate stable. A screw jack is provided for attachment between the lower and upper sections of the frame to control and support the latter when this operation takes place. As this method of collapsing the jib is rather complicated mechanically, and required 15 to 20 min. to carry out at each end of the face, it was decided that a roof trimmer (Fig. 4) may eliminate this task. The face proposed for the trials has top coal left to support a weak shale roof. This roof trimmer consisted of a toothed blade of hardened steel mounted on top of the plough and arranged to cover in width the highest parts of the jib frame. It was set so that the teeth were 1 in. clear of the newly exposed roof, but, if any convergence did take place, the blade would remove sufficient coal to allow the clear passage of the frame.

The picks used were supplied by Higher Speed


CUT 20 IN
M/C CUTTING AND LOADING UP FACE
5FT 6 IN.
CRAWLEY CONVEYOR
5FT
2FT 4IN.
5FT
3FT 11IN.
PACKS BEING BUILT
PACK 4YD. MIN.
WASTE 16 YD. MAX
PACK 4YD. MIN.
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PACKS TO BE MAINTAINED IN LINE WITH OR IN ADVANCE OF THE LAST ROW OF SUPPORTS AT THE WASTE EDGE
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FIG. 5.—METHOD OF SUPPORT ON 28'S FACE, HIGH HAZEL SEAM, WHITWELL COLLIERY.

Metals, Limited, and were of $1\frac{1}{2}$ in. gauge, $3\frac{1}{4}$ in. overall length, $1\frac{1}{16}$ in. by $\frac{9}{16}$ in. shank, and were tipped with tungsten carbide. A stop peg was set into the shank of the pick to assist in gauging and to prevent the pick being pushed too far into the box. A shallow recess in the sides of the shank gave a location for the pick stud and helped to prevent loss of the pick if the stud became slightly loose.

### Installation of the Prototype

For the purpose of the trials with the prototype unit, a short face was made available in the High Hazel Seam at Whitwell Colliery. The total length of this face is 104 yd., the supply gate stable being 10 yd. long, the loader gate stable 14 yd., leaving 80 yd. to be power loaded. The seam thickness is 3 ft. 8 in., and thickness extracted by the machine is 3 ft. 4 in.; this includes 4 in. of soft floor dirt taken to minimize prop penetration. Hence, approximately 8 in. of top coal is left up to assist in roof control. The face rises at a gradient of 1 in 5 from the loader gate to the supply gate, this being the direction of travel of the machine when cutting and loading. The cleavage line is parallel to the direction of advance of the face. Dowty hydraulic props and GHH metre link bars spaced at 2-ft. 9-in. centres are used on the face, with Dowty props and 4-ft. 6-in. Xplos bars in the stables. Strip packs, 4 yd. long and 17-yd. wastes with two chocks per waste complete the roof support system (Figs. 5 and 6).

The machine travels along mounted on a C40 tail-drive Crawley conveyor and is hauled by a $\frac{3}{4}$-in. dia. haulage rope anchored at each end of the face with a winch incorporated to provide rope tension. Gullick hydraulic push jacks are provided, spaced at 15-ft. centres along the face, to move the conveyor over. The power pack for these is situated in the loader gate. A long-wall coal cutter is used in each stable, and a Joy-Sullivan 20-in. stage loader delivers the coal from the face conveyor on to a 30-in. troughed belt conveyor in the roadway.

The operating team consists of one chargeman/machine operator, one cableman, six packers/timberers, four main-gate stable, and four supply-gate stable.

The unit started on May 4, 1959, and during the first shift some difficulty was experienced due to the irregularity of the face. One cut and flit was completed, however, and a line through the face established; by the end of the week the support system was fully installed and the team was familiar with the operation of the machine. Initially, the face was worked on one shift per day only, but after the first month, two shifts per day were worked.

The machine performed its functions of cutting and loading quite well from the start (Fig. 7). Maximum cutting speeds of 6 to 7 ft./min. were possible and the flitting operation could be carried out at the maximum speed of 14 ft./min.

At all times, the machine travelled along on the conveyor quite smoothly and the cutting horizon could be controlled easily by suitably grading the conveyor when pushing over. The new track for the conveyor was effectively cleared by the plough and the conveyor could be moved over directly the machine had passed on its return trip.

As the chain enters the cut at the roof and leaves at the floor, all gummings are brought out of the cut at a point where the body of the machine provides a screen against the ventilating air stream and airborne dust is therefore minimized. Some of the gummings are carried by the chain up to the sprocket and there delivered on to the plough or the conveyor. A water spray was provided at this point to suppress dust. This later proved to be unnecessary and was replaced by a jet arranged to impinge on the chain at the point where it re-entered the jib track above the sprocket. The amount of dust produced by the operation of the machine in these particular conditions, shown in Table 1, is very low and well within the statutory requirements.

Initially, the transverse cutter bar was fitted, the length of this being equal to half the total depth of cut, but after two cuts it was decided to remove this. No appreciable difference in the rate of travel was noticed and the lump coal could still be loaded satisfactorily by the plough, although there was a considerable decrease in the amount of fines produced.

It was found that whenever the conveyor stopped

TABLE 1.—*Comparison of Airborne Dust Conditions on Mechanized Faces at Whitwell Colliery.*

| | | 4's Trepanner. | 29's Anderton Shearer. | 28's Mawco. |
|---|---|---|---|---|
| Lenth of face (yd.) .. .. | | 150 | 150 | 97 |
| Ventilation | Quantity (cub. ft./min.) | 8,100 | 11,000 | 7,300 |
| | Velocity (ft./min.) | 300 | 460 | 240 |
| Humidity (per cent.) .. .. | | 90 | 95 | 90 |
| Mean particles per c.c. of airborne dust | | 367 | 969 | 322 |

for any reason, the machine must be switched off, or it would stall because of an accumulation of gummings. The Magnacut chain was not considered to be an efficient conveying medium for the gummings, since the succession of pick holders is too streamlined, with no "pockets" or projections to move the gummings along in the cut. Experiments with paddles welded to the shank of the picks (Fig. 8) were tried and, as a result, the stalling tendency of the machine was reduced. Samples taken showed a slight reduction in the percentage of ¼-in.-0 fines produced, indicating that the grinding effect due to the packing of gummings in the cut had been reduced.

The manufacture of such paddles could not be considered economical, however. In addition, they reduced the effective pick gauge and would, therefore, govern the maximum cutting speed of the machine by limiting pick penetration. An alternative means of increasing the carrying capacity of the chain within the profile of the existing boxes was sought and eventually it was decided to use connector links in conjunction with the pick boxes (Figs. 9 and 10). These connector links were made by removing the pick-holder boss from pick boxes. A chain was assembled with connectors alternating with pick boxes, so that of the total number of 42 boxes in the chain 21 were pick boxes and 21 were connectors. To make good the deficiency of picks, special "Y" picks were made from the standard pick forgings. This experiment was not a success and the chain was removed after one cut.

The fabricated picks were inadequate for the duty they were expected to perform and, since the cost of forgings was prohibitive, it was decided to compromise and amend the chain lacing. This time, 14 connectors were inserted in the chain, one after each two pick boxes, providing a total of 28 pick-holders, each containing a single pick. This reduced the maximum cutting speed to 5 ft. 6 in./min., which indicated that there were insufficient picks in the chain. A further relacing of the chain, using 10 connectors, each one placed between sequences of three and four successive boxes, gave a total of 32 picks, with additional positions in the outer clearance lines. The pick gauge was also increased from 1½ in. to 1¾ in., and the stop pegs in the pick shank, which were liable to damage and loss, were replaced by a projection forged integrally with the pick. This chain was put to work and proved to be

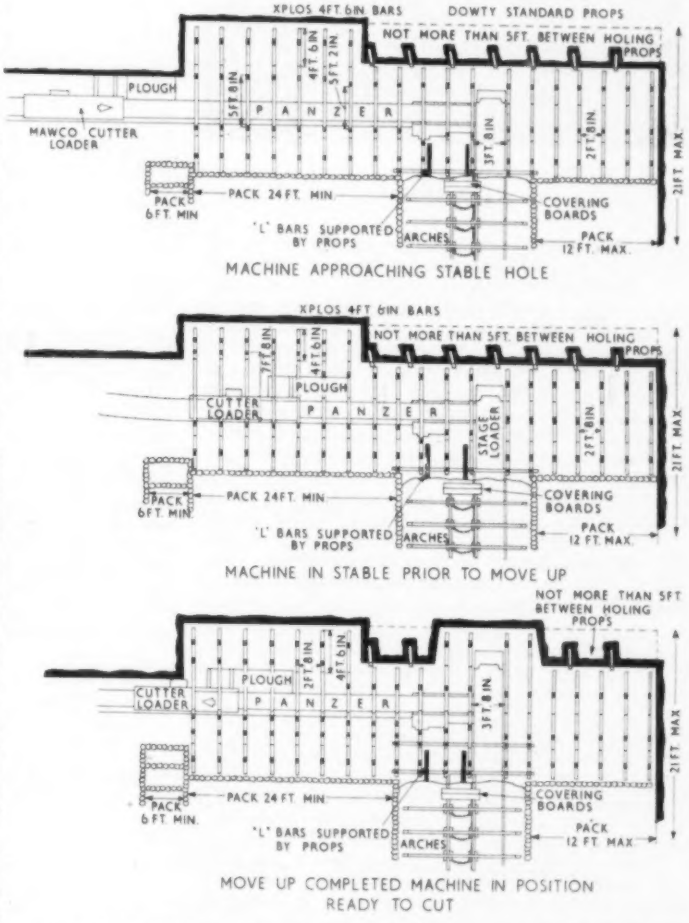
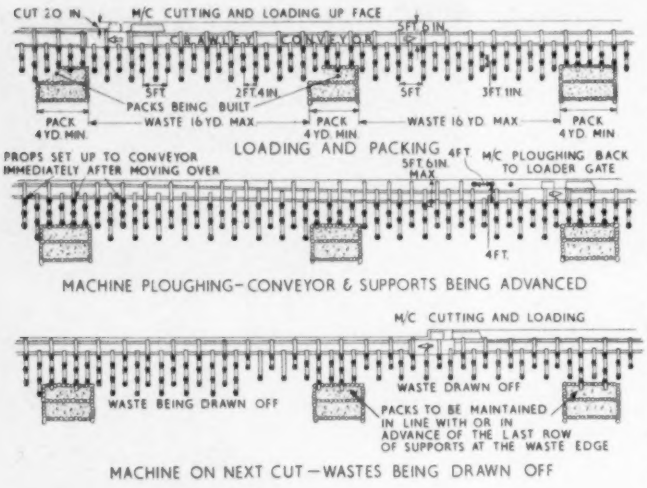



FIG. 6.—SYSTEM OF CONTROLLING AND SUPPORTING THE ROOF IN THE STABLE HOLES.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### Installation of the Prototype

For the purpose of the trials with the prototype unit, a short face was made available in the High Hazel Seam at Whitwell Colliery. The total length of this face is 104 yd., the supply gate stable being 10 yd. long, the loader gate stable 14 yd., leaving 80 yd. to be power loaded. The seam thickness is 3 ft. 8 in., and thickness extracted by the machine is 3 ft. 4 in.; this includes 4 in. of soft floor dirt taken to minimize prop penetration. Hence, approximately 8 in. of top coal is left up to assist in roof control. The face rises at a gradient of 1 in 5 from the loader gate to the supply gate, this being the direction of travel of the machine when cutting and loading. The cleavage line is parallel to the direction of advance of the face. Dowty hydraulic props and GHH metre link bars spaced at 2-ft. 9-in. centres are used on the face, with Dowty props and 4-ft. 6-in. Xplos bars in the stables. Strip packs, 4 yd. long and 17-yd. wastes with two chocks per waste complete the roof support system (Figs. 5 and 6).

The machine travels along mounted on a C40 tail-drive Crawley conveyor and is hauled by a $\frac{3}{4}$-in. dia. haulage rope anchored at each end of the face with a winch incorporated to provide rope tension. Gullick hydraulic push jacks are provided, spaced at 15-ft. centres along the face, to move the conveyor over. The power pack for these is situated in the loader gate. A long-wall coal cutter is used in each stable, and a Joy-Sullivan 20-in. stage loader delivers the coal from the face conveyor on to a 30-in. troughed belt conveyor in the roadway.

The operating team consists of one chargeman/machine operator, one cableman, six packers/timberers, four main-gate stable, and four supply-gate stable.

The unit started on May 4, 1959, and during the first shift some difficulty was experienced due to the irregularity of the face. One cut and flit was completed, however, and a line through the face established; by the end of the week the support system was fully installed and the team was familiar with the operation of the machine. Initially, the face was worked on one shift per day only, but after the first month, two shifts per day were worked.

The machine performed its functions of cutting and loading quite well from the start (Fig. 7). Maximum cutting speeds of 6 to 7 ft./min. were possible and the flitting operation could be carried out at the maximum speed of 14 ft./min.

At all times, the machine travelled along on the conveyor quite smoothly and the cutting horizon could be controlled easily by suitably grading the conveyor when pushing over. The new track for the conveyor was effectively cleared by the plough and the conveyor could be moved over directly the machine had passed on its return trip.

As the chain enters the cut at the roof and leaves at the floor, all gummings are brought out of the cut at a point where the body of the machine provides a screen against the ventilating air stream and airborne dust is therefore minimized. Some of the gummings are carried by the chain up to the sprocket and there delivered on to the plough or the conveyor. A water spray was provided at this point to suppress dust. This later proved to be unnecessary and was replaced by a jet arranged to impinge on the chain at the point where it re-entered the jib track above the sprocket. The amount of dust produced by the operation of the machine in these particular conditions, shown in Table 1, is very low and well within the statutory requirements.

Initially, the transverse cutter bar was fitted, the length of this being equal to half the total depth of cut, but after two cuts it was decided to remove this. No appreciable difference in the rate of travel was noticed and the lump coal could still be loaded satisfactorily by the plough, although there was a considerable decrease in the amount of fines produced.

It was found that whenever the conveyor stopped

TABLE 1.—*Comparison of Airborne Dust Conditions on Mechanized Faces at Whitwell Colliery.*

| | | 4's Trepanner. | 29's Anderton Shearer. | 28's Mawco. |
|---|---|---|---|---|
| Lenth of face (yd.) .. .. | | 150 | 150 | 97 |
| Ventilation | Quantity (cub. ft./min.) | 8,100 | 11,000 | 7,300 |
| | Velocity (ft./min.) | 300 | 460 | 240 |
| Humidity (per cent.) .. .. | | 90 | 95 | 90 |
| Mean particles per c.c. of airborne dust | | 367 | 969 | 322 |

for any reason, the machine must be switched off, or it would stall because of an accumulation of gummings. The Magnacut chain was not considered to be an efficient conveying medium for the gummings, since the succession of pick holders is too streamlined, with no "pockets" or projections to move the gummings along in the cut. Experiments with paddles welded to the shank of the picks (Fig. 8) were tried and, as a result, the stalling tendency of the machine was reduced. Samples taken showed a slight reduction in the percentage of ¼-in.-0 fines produced, indicating that the grinding effect due to the packing of gummings in the cut had been reduced.

The manufacture of such paddles could not be considered economical, however. In addition, they reduced the effective pick gauge and would, therefore, govern the maximum cutting speed of the machine by limiting pick penetration. An alternative means of increasing the carrying capacity of the chain within the profile of the existing boxes was sought and eventually it was decided to use connector links in conjunction with the pick boxes (Figs. 9 and 10). These connector links were made by removing the pick-holder boss from pick boxes. A chain was assembled with connectors alternating with pick boxes, so that of the total number of 42 boxes in the chain 21 were pick boxes and 21 were connectors. To make good the deficiency of picks, special "Y" picks were made from the standard pick forgings. This experiment was not a success and the chain was removed after one cut.

The fabricated picks were inadequate for the duty they were expected to perform and, since the cost of forgings was prohibitive, it was decided to compromise and amend the chain lacing. This time, 14 connectors were inserted in the chain, one after each two pick boxes, providing a total of 28 pick-holders, each containing a single pick. This reduced the maximum cutting speed to 5 ft. 6 in./min., which indicated that there were insufficient picks in the chain. A further relacing of the chain, using 10 connectors, each one placed between sequences of three and four successive boxes, gave a total of 32 picks, with additional positions in the outer clearance lines. The pick gauge was also increased from 1½ in. to 1¾ in., and the stop pegs in the pick shank, which were liable to damage and loss, were replaced by a projection forged integrally with the pick. This chain was put to work and proved to be

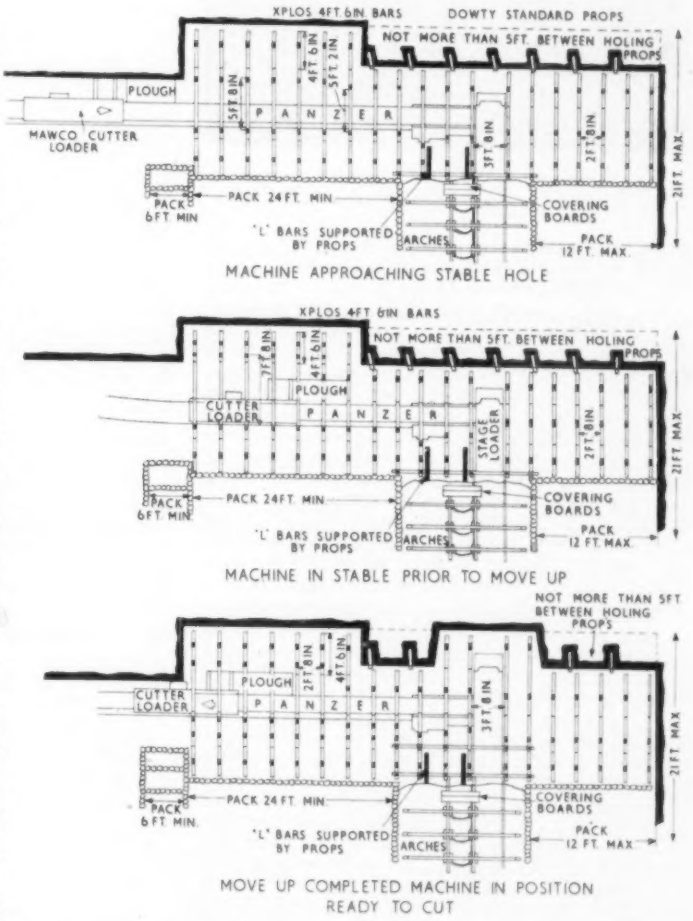


FIG. 6.—SYSTEM OF CONTROLLING AND SUPPORTING THE ROOF IN THE STABLE HOLES.

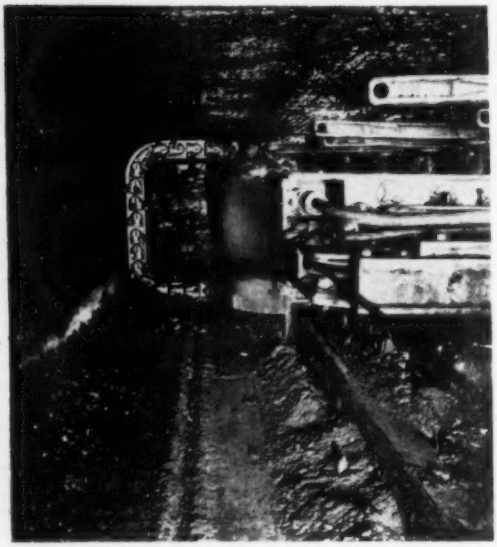

FIG. 7.—MACHINE MOUNTED ON THE ARMOURED CONVEYOR.

quite satisfactory, restoring the cutting speed and giving better clearance for gummings comparable with the flights previously used.

The roof trimmer blade proved effective whenever convergence took place, on occasions removing approximately 2 in. of roof coal to allow the jib sufficient clearance while flitting back at full speed. The lowering of the roof was only noticeable along the goaf side of the track and, presumably, the fillet of coal left by the jib, shown in Fig. 11, played some part in controlling the roof movement adjacent to the face.

The plough has been in use since the machine started work. During this period 64,000 yd. of cutting has been completed, but wear is negligible, although the hinged blade, used to collect gummings from the floor, has been damaged due to operational mishaps.

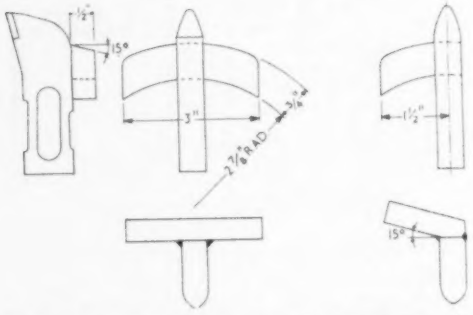


FIG. 8.—FLIGHTS WELDED TO THE SHANKS OF THE PICKS.

From the installation on May 4, 1959, to the end of that year, the machine produced 41,051 tons of saleable coal at an average face o.m.s. of 111.8 cwt., and a wages cost per ton of 15s. 3d. The best weekly o.m.s. was 156.6 cwt. at a wages cost per ton of 12s. 4d. and the highest weekly tonnage 1,793 (saleable). These are excellent results considering that this machine is the first prototype and that the face length is very short.

**Further Installation at Whitwell Colliery**

The success of the experiment on 28's face led to a decision to install a Mawco on 33's unit, also in the High Hazel Seam at Whitwell Colliery; this unit was to replace a shearer face.

The face, which is 197 yd. long, is 14 deg. off end. The size of the stables is as before, 14 yd. long at the main gate, 10 yd. long at the supply gate, with 173 yd. remaining to be power loaded.

The method of roof support used on the face incorporates Dobson props, slide bar heads, and 7-ft. 6-in. long, 4-in. by 4-in. section, slide bars, with Dobson chock-props set between each bar at the waste edge, behind which the roof is caved. Roof support in the stables is provided by Dobson props and 4-ft. 6-in. long Xplos bars.

A Crawley armoured flexible conveyor is used on the face with 40-h.p. drives at each end of the conveyor; this delivers on to a Joy Sullivan 20-in. stage loader. Longwall coal cutters are used in each stable to prepare the coal for shotfiring and hand filling.

Temporary supports are set on the face side of the conveyor behind the machine as it is loading and removed again in front of the machine as it flits back. This is due entirely to the peculiar nature of the coal roof, which tends to fall in slabs if these props are not set. It is considered that, under normally good roof conditions, this extra timbering would not be necessary.

This new face was started using a B.J-D shearer machine fitted with a 70-h.p., 1-hr. rated motor and Magnamatic haulage unit. The machine was converted in a similar manner to the Eickhoff shearer and equipped with a 40-in. by 23-in. frame plough and ancillary parts. The speed of the sprocket shaft in this case was 118 r.p.m., which gave a chain speed of 520 ft./min., and in practice proved to be an advantage by enabling the machine to cut

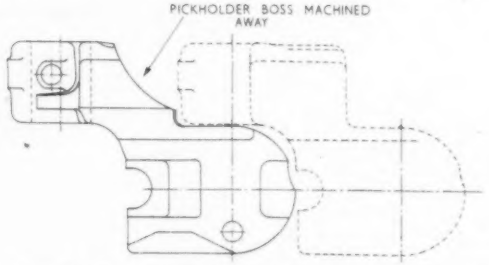


FIG. 9.—CONNECTOR BOX TO INCREASE THE CARRYING CAPACITY OF THE CHAIN.

at almost the same speed as the Eickhoff, *i.e.*, approximately 5 ft. 6 in./min. maximum, although the actual horsepower of the motor was less.

The unit started work on September 14, 1959, and the experience gained on 28's face could be practically applied, since the operating conditions were very similar.

The gradient along the face varied from 1 in 28 in favour to 1 in 4½ against the cutting direction and included two undulations. These changes in gradient made the use of the roof trimmer impossible and, since the greater length of face increased the duration of the cutting cycle, the effect of convergence was, at times more pronounced, and it became necessary to collapse the jib more frequently. The removal of the existing sections necessary to do this took a considerable time at each end of the face (15 to 20 min. at each end) and in an attempt to simplify the arrangement an alternative method was devised and incorporated in a 43-in. by 27-in. frame, intended to replace the existing 40-in. by 23-in. frame. In this, the support plate for the upper section of track was replaced by a similar plate, which had two radial slots engaging with 1½-in. dia. screwed pins and an additional hinge bracket. The section of the vertical track was removed as before; the use of the screw jack was still required, but to release the upper jib section it was only necessary to slacken the two 1½-in. dia. screws until the heads were clear of a machined recess. The jib could then be collapsed, using the screw jack, the moving portion being controlled by the hinge end and the two screwed pins. Thus, the need to remove 12 1-in. dia. set screws to release the support plate was eliminated. Re-erection of the jib was the reverse of the above procedure. The men on the machine quickly improved the process by using a hydraulic prop for support instead of the screw jack.

A disturbing feature of the installation was the short life obtained from the haulage rope. Tests were carried out to determine the pull in the rope, but these only confirmed that the load was well within the rope strength.

These tests were made using Statimeter rope pull measuring instruments in conjunction with Cambridge recorders so that a permanent copy of the results could be obtained. This equipment was

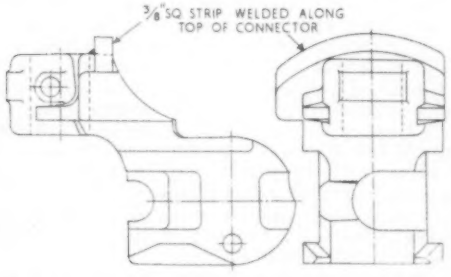


FIG. 10.—CONNECTOR BOX WITH FLIGHT ADDED.

FIG. 11.—PROFILE OF THE CUT AT THE BUTTOCK AND THE ROOF AND FLOOR FILLETS LEFT BY THE JIB.

made available by the Central Engineering Establishment, Bretby, and the CEE's assistance in this matter is greatly appreciated.

One Statimeter was secured to the haulage rope at each end of the face and these were connected to Cambridge recorders. The clockwork mechanism driving the recording charts ran for a duration of 60 min., giving a reasonably clear trace line of the rope pull variations, but, due to the length of the cutting cycle, three charts were needed to record the full period. The tight side T1, and the slack side T2, tensions were measured and recorded simultaneously for the cutting cycle. While the B.J-D Magnamatic haulage machine and 40-in. by 23-in. size frame were in use at the start of the cut, the T1 tension was 6.5 tons and the T2 tension 1.5 tons. These tensions increased uniformly as the machine proceeded through the face until, at the end of the cut, the T1 tension became 11 tons and T2 tension 5 tons. Peaks occurred whenever the machine traverse was checked by stalling of the cutting chain or by lumps jamming against roof bars while passing through the plough.

A similar test was made when the Eickhoff machine was installed, still using the 40-in. by 23-in. size frame and, in a similar fashion, the results followed closely the form of the previous results obtained from the B.J-D machine, with T1 starting from 5 tons tension and increasing to 11 tons.

When the 43-in. by 27-in. size frame was fitted to the Eickhoff machine, further readings were obtained to establish the additional pull transmitted to the haulage rope by this increased duty. T1 tension at the commencement of the cutting cycle was 7 tons and T2 tension 2 tons; these tensions

increased as before until at the end of the cut T1 tension had become 13.5 tons and T2 tension 5.5 tons. The average cutting speed during this test, excluding time for stoppages, was 4.32 ft./min. Interruptions in the graphs produced were more numerous, due to lumps jamming in the plough, this trouble later being minimized by the modifications to the plough.

The breaking strain of the rope was given as 22.5 tons, so, from the results obtained by these tests, it could be assumed that the tensile pull in the rope was not directly responsible for the short working life obtained.

From tests taken during the flitting operation the rope tension was found to remain constant at approximately 7.5 tons. Examination of the operating conditions, however, revealed several undesirable factors, indicating that the ropes were failing prematurely due to damages caused by:—

(*a*) The small diameter of the capstan drum on the machine.

(*b*) The undulations on the face causing the rope to rub on the moving flights of the conveyor.

(*c*) Increase in rope tension accentuating the effect of (*b*) as the machine moved through the undulations.

(*d*) Bad design of the haulage rope guide pulley bracket attached to the gearhead of the machine. This was marked in a manner showing that the rope at times left the pulley groove and became trapped between the pulley flange and the bracket. This bracket has since been modified to eliminate recurrence of this form of damage.

As the face advanced the undulations became less prounounced and rope troubles decreased.

The machine was replaced by an Eickhoff machine fitted with the larger 43-in. by 27-in. frame and, after the first shift, during which the support system was adjusted to meet the increased depth of cut, a comparison was possible between the two sizes of frame. The size of the lump coal produced was obviously increased and, although it continued to break into blocks as it was deflected by the plough, these blocks were liable to foul the ends of the slide bars. To overcome this, the hinged door of the plough was modified by removing the top corner diagonally from the hinge to a point half way down the outer edge of the door and adding a wedge, 6 in. high, along the bottom of the door. The position of the stop for the door was adjusted to allow this to swing further back, the overall effect being to allow the blocks of coal to follow a more direct line on to the conveyor, while the wedge tilted the block sufficiently to ensure that, in the event of a projecting bar end coming into contact with the block, it would move over without staking into the plough.

The maximum cutting speed of the machine was reduced to approximately 5 ft. 3 in./min. and it was assumed that this may be due to gummings in the increased length of cut. As a further experiment to increase the conveying qualities of the chain a ¼-in. sq. strip was welded along the top edge of the connector pockets at right angles to the direction of chain travel, in a chain laced as described earlier. This chain was fitted to the machine and proved to be the remedy, and cutting speed was increased to a maximum of 5 ft. 9 in. per min. (Fig. 10).

From this time the machine has performed consistently and the average yardage cut per shift during December, 1959, was 342, the best performance being 460 yd. loaded in one shift, this being comprised of two complete cycles, cutting and flitting, plus 100 yd cutting.

For the 16 weeks in which the machine was working up to the end of 1959, 31,437 tons of saleable coal were produced at a face o.m.s. of 138.1 cwt. and a wages cost of 13s. 5d./ton. For the last six weeks of 1959 the o.m.s. was 176.4 cwt. at a wages cost of 11s. 9d. per ton. The best weekly results obtained were an o.m.s. of 182.8 cwt. at a face wages cost of 11s 4d. and a tonnage of 2,669 tons (saleable).

### Study of Operations

In order to compare the operation of this machine with that of other power loaders in the same seam and at the same colliery, method studies were taken and the following information is taken from the study on 33's Mawco face.

The machine operates on the day and night shifts leaving the afternoon shift available for advancing the stage loader and maintenance work. The stable holes are machine cut and hand loaded on the day and night shifts.

The sequence of operations commences with the traversing of the machine in the main-gate stable. The machine is pushed over and the jib prepared for cutting, the picks examined and changed where necessary. The machine is moved through the face, cutting and loading the coal on to the conveyor. Temporary supports are set behind the machine at 10-yd. intervals to help support the weak roof until the machine is flitted back. When the machine reaches the tail-gate stable the jib and chute are cleaned of coal and the plough hinged plate positioned for ploughing. If necessary, the cutter jib is collapsed for the flit back. The machine is then flitted back through the face, cleaning up all coal left from the cutting and loading operation. The conveyor is snaked over behind the machine, the slide bars advanced, and the gob legs withdrawn and reset up to the conveyor; the final operation is to withdraw and reset the props supporting the waste edge.

*Traversing the machine in the loader gate stable.*—The work elements involved in advancing the machine and preparing to cut were as follow:—(*a*) Clean up for machine to enter stable; (*b*) move into stable; (*c*) prepare jib for cutting; (*d*) examine and change cutter picks, and (*e*) advance machine.

A time study of these operations produced element times of (*a*) 3.99 min., (*b*) 1.06 min., (*c*) 14.76 min., (*d*) 11.51 min., and (*e*) 22.2 min., respectively, with an overall allowed time of 24.4 min., since work elements (*a*) and (*d*) progressed simultaneously. On average, 10 picks are changed after each cut through the face.

*Machine movement through face (cutting and loading).*—Detailed studies of the machine move-

ment while cutting produced an optimum speed of 4.50 ft./min. This takes into consideration the time taken for the machine to "pick-up" after being held for lumps fouling the roof or roof timber behind the machine. Speeds up to 6 ft./min. were recorded when the machine run was uninterrupted.

The fact that the machine cuts in the floor of soft clunch, the extracted section of which varies between 2 in. and 10 in., seemingly has little effect on the machine cutting speed.

The lumps produced by the machine require to be lifted approximately 8 in. on to the conveyor and, due to collection of gummings on the floor of the plough plate, the lumps are further lifted and tend to foul the roof.

During the period studied, accumulated delays per cut amounted to averages of 7.26 min. due to lumps and 4.89 min. due to the machine stalling. Accepting 4.50 ft./min. as the optimum machine speed maintained and assuming no delays, it would take 115.3 min. to cut through the face.

*Prepare machine for flitting.*—The work elements involved in preparing to flit the machine, together with the element times are as follow:—(*a*) Clear coal from machine and adjust plough (4.14 min.); (*b*) adjust jib for flitting (4.89 min.); (*c*) attend cables (2.44 min.). The overall allowed time is 7.36 min., each element being progressed concurrently.

*Machine movement (flitting).*—The study of machine speed while flitting resulted in an optimum speed of 17.0 ft./min. Assuming this speed is maintained and there are no delays, it would take 30.53 min. to travel to the loader gate.

*Cycle time.*—The average advance per cut by the machine during the study was 2 ft. 1½ in. and from the above observations the overall time per cycle (*i.e.*, cut and load and plough back) would be:—

(*a*) Advance machine in stable and prepare to cut, 24.4 min.

(*b*) Cut and load 173 yd. at 4.50 ft./min., 115.30 min.

(*c*) Prepare machine to flit/plough, 7.36 min.

(*d*) Flit/plough at 17.0 ft./min., 30.53 min.

Total time per cycle, 117.59 min.

*Machine performance.*—The total shift time is 480 min. Deducting travelling time of 68 min. in both directions, preparing for work and finish 10 min., snap time 15 min., the available working time is 387 min. Therefore, the machine at optimum performance would cut, load, and advance 2.18 webs or 377 yd.

*Manpower deployment.*—Table 2 shows the deployment of the face manpower on all three shifts.

## Size of Product

Sizing tests have been taken on both faces, and include both frame sizes used on 33's face; the following figures are the average of three tests in each case. The results shown for the 40-in. by 23-in. frame on 33's face differ from the similar size on 28's face, this being due to the breaker bar on 33's face while samples were taken (Table 3). These results also indicate the extent of the benefit to be obtained from increasing the size of the frame.

TABLE 2.—*Deployment of Manpower on 33's on All Three Shifts.*

| Job. | Days. | Afters. | Nights. | Total. |
|---|---|---|---|---|
| Machine operator | 1 | — | 1 | 2 |
| Cables | 1 | — | 1 | 2 |
| Chargehand | 1 | — | 1 | 2 |
| Snake conveyor (clear lumps from plough when cutting) | 1 | — | 1 | 2 |
| Temporary supports | 1 | — | 1 | 2 |
| Advance slide bars, withdraw and set props | 8 | — | 8 | 16 |
| Pack under and align conveyor | 1 | — | 1 | 2 |
| Loader gate stable | 5 | — | 5 | 10 |
| Supply gate stable | 4 | — | 4 | 8 |
| Total team | 23 | — | 23 | 46 |
| Rippers | 8 | — | 8 | 16 |
| Shotfirers | 1 | — | 1 | 2 |
| Deputies | 1 | — | 1 | 2 |
| Conveyor attendant | 1 | — | 1 | 2 |
| Fitters | 1 | — | 1 | 2 |
| Others | — | 1 | — | 1 |
| Grand total | 35 | 1 | 35 | 71 |

Table 4 shows a product sizing between hand-got and machine-got coals. All these tests were taken at Whitwell Colliery in the same seam and under similar conditions. The tests consisted of three samples for each machine gathered from the gate belt. Each sample was taken over one working cycle and consisted of 20 increments. The whole

TABLE 3.—*Sizing Tests on Mavco Faces in High Hazel Seam, Whitwell Colliery.*

| Nominal size. | Run of mine. | | | Saleable. | | |
|---|---|---|---|---|---|---|
| | 28's face. | 33's face. | 33's face. | 28's face. | 33's face. | 33's face. |
| | 40-in. by 23-in. jib. per cent. | 40-in. by 23-in. jib. per cent. | 43-in. by 27-in. jib. per cent. | 40-in. by 23-in. jib. per cent. | 40-in. by 23-in. jib. per cent. | 43-in. by 27-in. jib. per cent. |
| Over 6-in. round | 22.1 | 17.7 | 27.9 | 28.6 | 21.8 | 33.6 |
| 6-in. to 4-in. | 7.7 | 9.5 | 12.0 | 9.1 | 7.5 | 14.1 |
| 4-in. to 2-in. | 11.7 | 11.0 | 12.6 | 11.9 | 12.2 | 14.0 |
| Total over 2-in. | 41.5 | 38.2 | 52.5 | 49.6 | 41.5 | 61.7 |
| 2-in. to 1-in. | 5.2 | 4.7 | 4.4 | 4.6 | 4.2 | 4.4 |
| 1-in. to ½-in. | 10.0 | 12.2 | 10.5 | 8.7 | 11.2 | 9.7 |
| ½-in. to ⅛-in. | 24.6 | 26.7 | 20.5 | 23.7 | 24.5 | 16.2 |
| ⅛-in. to 30 mesh | 11.1 | 12.6 | 8.5 | 8.0 | 10.1 | 5.7 |
| Through 30 mesh | 7.6 | 5.6 | 3.6 | 5.4 | 4.5 | 2.3 |
| Total under 2-in. | 58.5 | 61.8 | 47.5 | 50.4 | 54.5 | 38.3 |

TABLE 4.—*Large Coal Comparisons between Hand-got and Machine-got Methods at Whitwell Colliery, in the High Hazel Seam.*

| Size. | Hand-got/ machine cut. | Anderton shearer. | Trepanner. | Mawco. |
|---|---|---|---|---|
| | Per cent. | Per cent. | Per cent. | Per cent. |
| Over 6-in. .. .. | 20.1 | 1.6 | 10.2 | 27.9 |
| 6-in. to 4-in. .. | 17.2 | 1.9 | 6.6 | 12.0 |
| 4-in. to 2-in. .. | 20.1 | 3.9 | 10.6 | 12.6 |
| Total large coal.. | 57.4 | 7.4 | 27.4 | 52.5 |
| 2-in. to 1-in. .. | 14.5 | 11.3 | 7.5 | 4.4 |
| 1-in. to ½-in. .. | 10.1 | 23.3 | 14.2 | 10.5 |
| ½-in. to ⅛-in. .. .. | 11.5 | 34.5 | 28.1 | 20.5 |
| ⅛-in. to 0 .. .. | 6.5 | 23.5 | 22.8 | 12.1 |
| Total small coal.. | 42.6 | 92.6 | 72.6 | 47.5 |

of each sample of 4 to 5 tons was screened at 6-in., 4-in., and 2-in., and these fractions were hand cleaned. The 2-in. size was further screened at 1-in., ½-in., ⅛-in., and 30-mesh, and each fraction submitted to a float and sink test at a specific gravity of 1.60. These results indicate that the Mawco produces a greater proportion of large coal than either the shearer or the trepanner, or almost equals that which is produced by hand-got methods.

### Observations on Jib and Chain Wear

Based on experience in the conditions prevalent at Whitwell, where the bottom section of the frame cuts in floor dirt, it has been decided to limit chain life to 15,000 yd. of cutting for a new chain and 9,000 yd. after reconditioning. During the life of a new chain two boxes may be removed to keep the adjustment within reasonable limits. If the new chain is taken off after 15,000 yd., wear is mainly confined to the ball stems and the liners of the joint, which can be renewed quite easily at a reasonable cost. On this basis chain costs would be 6s. 8d./ton. It is not considered advisable to recondition the chain a second time, since wear on the box would render this unreliable for further service.

The cost of new picks issued during December, 1959, was 1.2d./ton; these are, of course, resharpened as normal practice, and, also, the back stop is built up with metal to maintain the correct gauge length, but only until the tungsten-carbide tip has been reduced to half its original length. These re-sharpened picks are used only on the intermediate lines, new picks being inserted in the outer clearance boxes of the chain.

The operating life of the frame jib appears to exceed 30,000 yd., particularly if strict attention is given to the renewable wearing strip on the inside of the upper and lower vertical bends and also on the inclined guides leading to the sprocket. These wearing strips should be inspected weekly to ascertain the amount of wear taking place. The bolts or rivets used to secure them should also be examined for tightness. The curved wearing strips on the bends were usually found to need changing after 10,000 yd. of cutting, but recently the width of these has been increased, providing a greater contact area between the wearing strip and the box. The affect of this modification on the life of the wearing strips cannot yet be assessed. It should be pointed out that a slight alteration to the side of the pick boxes and connectors was necessary, but all future chains will be suitable for the wider strips which are to be incorporated in all frames.

The wearing strips fitted to the inclined guides may require renewal after 25,000 yd. of cutting; this will necessitate taking the frame to the surface, but since this yardage is equivalent to the life of a new chain plus a reconditioned one, it may be possible to initiate a system whereby a new chain and jib are fitted at this stage and the sequence repeated while the frame is reconditioned. Arrangements are in hand for wider wearing strips at these points, with similar benefits to those expected at the vertical curves. By attending to these items wear is confined to expendable parts and when the jib is taken out of service it can be reconditioned more economically. Chain adjustment is of primary importance and over-tightening should be avoided; on the other hand, excessive slackness will give rise to vibration as the chain leaves the sprocket and enters the track. Picks should be inspected before each cut and renewed as necessary.

A programme has been prepared for trials in other coalfields so that the operation of the

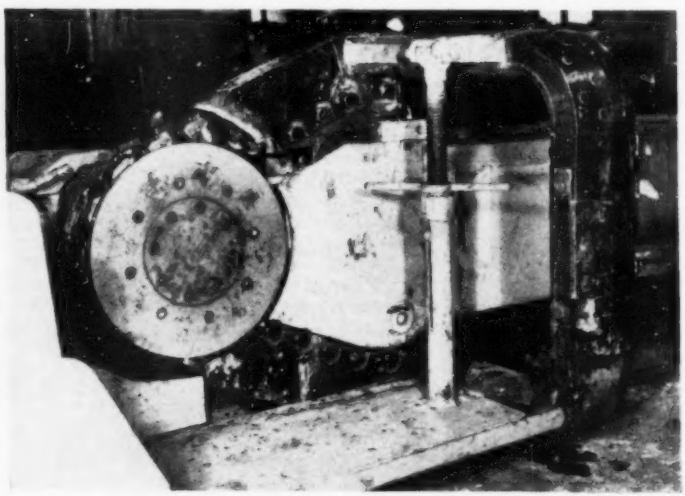

FIG. 12.—FRAME IN THE NORMAL CUTTING POSITION EXCEPT FOR THE JACK IN POSITION READY TO START COLLAPSING THE JIB.

machine can be observed under the most varied conditions and the limits of the application appreciated. In the first few months of 1960, 21 frames will have been manufactured and despatched, six to the No. 1 Area of the East Midlands Division, three to other Areas in the division, and 12 to other divisions.

### Future Developments

Another method of collapsing the frame is to be tried. This new method employs a vertically sliding member which supports the upper half of the frame and which can be locked in the raised position quite simply by a pivoted quadrant engaging in a slot at the edge of the vertical slide. The screw jack is used to raise or lower the top section as before, but with this method some mechanical or hydraulic means could be incorporated. The time taken to collapse or re-erect the jib is 4 min., but this does not include time for the removal of coal from the plough before starting to collapse the unit (Figs. 12, 13, 14, and 15).

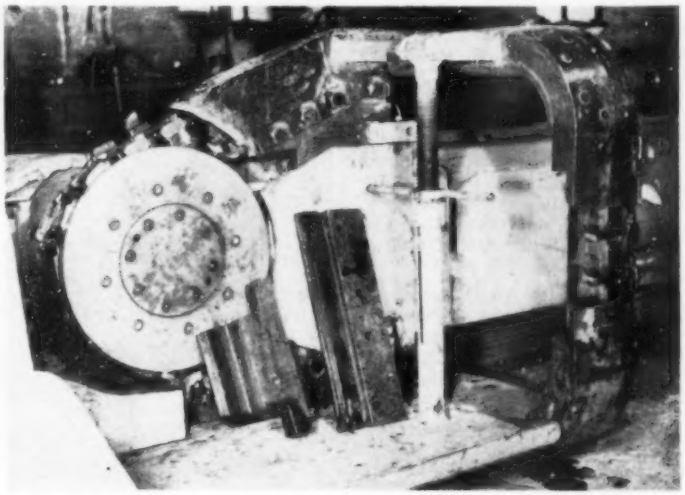

FIG. 13.—PLATES REMOVED FROM THE VERTICAL SECTION OF THE FRAME.

To discover the relationship between chain speed and cutting speed another experiment is to be made using a 15-tooth sprocket in place of the one at present, which has 14 teeth. This will provide a chain speed of 504 ft./min. and should make possible an increase in cutting speed of approximately 6 in./min. This increase in chain speed may have some effect on chain wear, and this problem is also under consideration. It is intended that the radius of the horizontal bends be increased from 7 in. radius to 10 or 11 in. radius measured along the pitch line of the chain. This will reduce the angular movement of the ball stem relative to the liners in each of joints of the chain as it passes round these bends. The decrease in movement will permit more metal in the liners covering the ball and this will increase the area of contact, giving a more distributed loading between the two components. The increased area of engagement will be most advantageous at the lower bend, for at this point the chain is subjected to the greatest tension while the joints are open as the chain passes around the bend.

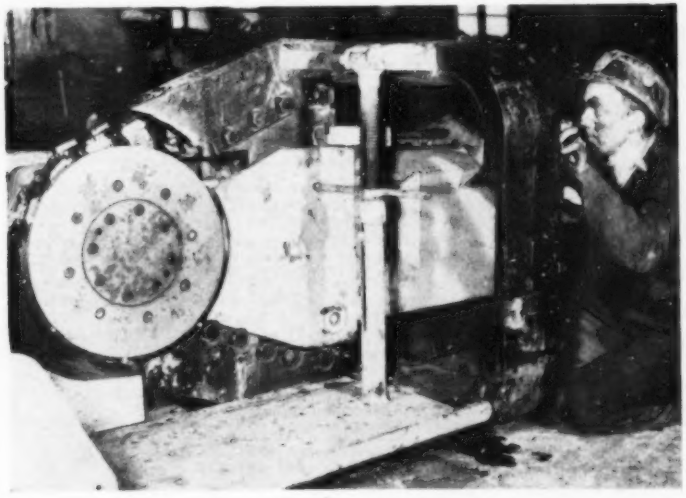

FIG. 14.—WITHDRAWING THE LOCKING QUADRANT.

An alternative type of ball joint chain can be applied to this frame jib; this has the advantage of a direct pull along the pitch line of the chain against the offset pull present in the Magnacut chain. Also it is less streamlined and would be a better conveying medium for the gummings. Although this chain is not in general use, an experiment using it on a flat jib in conjunction with a normal longwall coal cutter has been made and the results justify the development of a prototype Mawco frame suitable for use with the chain. Work on this is already in hand and the design of the frame will include the collapsible feature considered essential if the application is to embrace the widest possible

variety of conditions. While the large coal produced by the Mawco will not be materially affected, the quantities of the fractional sizes will be reduced and higher cutting speeds should be possible. The results of the coal face trials with this frame jib and chain will be available by June or July, 1960, and these will govern the decision on the type which will be produced as a standard model.

At present all conversions have been confined to Eickhoff and B.J-D machines, which have the drum shaft at right angles to the body of the machine. To extend the scope of the conversion it is necessary to include machines in which the drum shaft is not at right angles to the body of the machine, and modifications are at present being made to an AB shearer gearhead, which has a 3-deg. angle of lag on the output shaft. In this modification the drum shaft is removed entirely and a special shaft, suitably extended to receive the sprocket, is fitted in place of the existing second motion shaft. The side cover, housing the bearing for this shaft, has been modified in the prototype version, but it is expected that a new component will be made available for future conversions. Provision for mounting the jib post is also to be included and the underframe will have the fender and towing bracket for the plough added. It is intended that a standard frame jib be used initially; the plane of the cutting profile will, therefore, be displaced by 3 deg. from its normal position at right angles to the direction of advance of the machine. This should not adversely affect the cutting action, and will eliminate the need for special jibs for use with this type of machine.

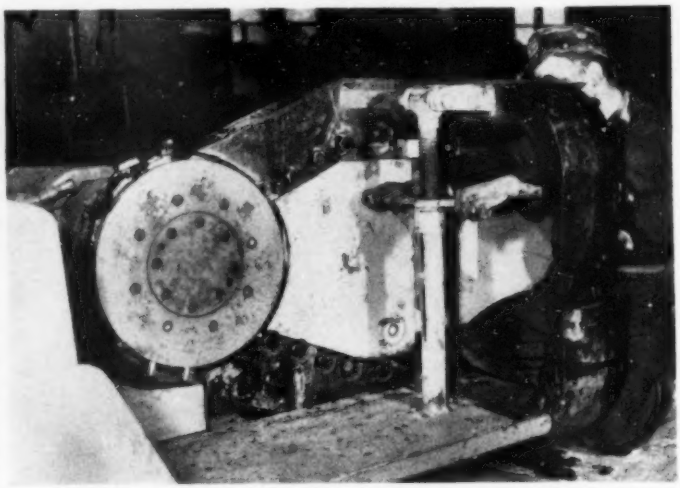

FIG. 15.—LOWERING THE JACK TO COLLAPSE THE FRAME. THE MACHINE IS FLITTED BACK IN THIS POSITION.

The next step, from a mining point of view, is to introduce self-advancing supports on to the face. By so doing it is anticipated that face o.m.s. will be increased to approximately 12 tons. It is expected also that with powered supports it may be possible to work on the top of the soft floor, thus eliminating the cutting in the dirt, with all the consequent expense incurred in machine wear, transport, and, most of all, in cleaning the smalls.

### Comparison of Performance

Three power loaders have been used in the Hazel Seam at Whitwell Colliery and observations relative to their respective performances have been made by the Area method study department. The basic data obtained is shown in Table 5.

The normal face at this colliery for power loading is 200 yd. long, giving a machine operating length of 175 yd. The available time for machine operation on the face is 6 hr. 30 min. If, therefore, the basic data obtained from the method study of the three different machines are applied to these standard conditions, the optimum machine performance per shift can be calculated.

TABLE 5.—*Relative Performance of Various Power Loaders in the High Hazel Seam.*

| Item. | Anderton shearer Magnamatic. | Trepanner. | Mawco Miner. |
|---|---|---|---|
| Optimum cutting speed (ft./min.) | 7.10 | 4.75 | 4.5 |
| ,, flitting speed (ft./min.) | 21.07 | — | 17.0 |
| ,, reversing time cut to flit (min.) | 4.46 | — | 7.36 |
| ,, traversing time in stable (min.) | 20.85 | 29.75 | 24.4 |
| Operational delays (min./100 yd. cut) | 6.92 | 3.46 | 7.1 |

These are shown in Table 6, from which can be seen that the actual tonnage loaded per shift

TABLE 6.—*Calculated Optimum Machine Performance.*

| Item. | Anderton shearer Magnamatic. | Trepanner. | Mawco Miner. |
|---|---|---|---|
| Optimum time to cut 175 yd.(min.) | 74.0 | 110.0 | 116.5 |
| ,, time to flit 175 yd. (min.) | 24.9 | — | 30.9 |
| Reverse cut to flit (min.) | 4.5 | — | 7.4 |
| Traverse machine in stable (min.) | 21.0 | 29.8 | 24.4 |
| Operational delay for 175 yd. cut (min.) | 12.1 | 6.1 | 12.4 |
| Expected opt. time per cycle (min.) | 136.5 | 145.9 | 191.6 |
| Expected cycles per shift of 390 min. | 2.86 | 2.68 | 2.04 |
| Advance per shift (And'n 20-in., trep. 27-in., Mawco 27-in.) | 4 ft. 9 in. | 6 ft. 0 in. | 4 ft. 7 in. |
| At 3-ft. 6-in. section cu. yd. loaded per shift (inc. stables) | 323 | 408 | 312 |
| At 30 cu. ft./ton, tons loaded per shift | 291 | 367 | 281 |

is roughly the same for the shearer and the Mawco, but the trepanner gives a considerably higher figure.

Evaluating in sterling the size analyses given in Table 3 and relating these to the tonnages produced per shift as given in Table 6, the value of the product per shift from the shearer is worth £160 less than that from the Mawco and £400 less than that from the trepanner. These are, of course, figures based on gate belt samples and theoretical performances and would, therefore, not be fully representative of the actual pithead product. It should also be noted that, in practice, the average weekly gross tonnage produced by the three types of machine was, in fact, virtually the same.

### Conclusions

From the trials of the Mawco loader at Whitwell Colliery it would appear that this machine is a fairly simple conversion of the Anderton shearer, which will give a product almost comparable in size to that derived from hand filling. Its performmance under other conditions will, of course, only be known when extended trials have been made, but it does appear that this machine might be as universal in application as the Anderton shearer.

The strong point of the machine is its reliability, and even though the cutting portion was entirely new, the coal lost through breakdowns has been almost negligible.

### Acknowledgments

The author thanks Mr. J. C. Mawson, Area mechanization engineer, No. 1 Area, and his assistant, Mr. M. Cowley, who together conceived the idea of this machine and who have played a tremendous part in its development.

The manufacturers of the frame and chain, Austin Hoy & Company, Limited, played a large part in producing the first prototype, in a very short space of time, and, of course, in its subsequent development. The machine is an excellent example of a product of the team work of the engineer, the manager, the manufacturer, and the workman.

## DISCUSSION

MR. C. ROUND commented that the relative circumferential speed of the breaker bar and that of the chain might possibly cause difficulty where hard sections of a seam were encountered. Such difficulty might well be resolved by increasing the circumferential speed of the breaker bar by driving it from the second or other suitable motion shaft in the gearbox. It was felt that the figure of 15,000 yd. for the chain life should be considered with some reserve. The abrasive action of soft seams similar to the one described was well known, and it was quite probable that the life of the chain in harder seams might well be increased.

The principle of self-support, illustrated by the roof fillet, was extremely interesting. One could visualize the possible advantage in cases where weak friable roofs "cut off" at the coal face.

It was also felt, said Mr. Round, that the floor fillet might well contribute to supporting the coal face, preventing loose coal falling off as with machines which had a pre-cut.

The AUTHOR stated that, in theory, the trepanner had a greater productive capacity than both the shearer and the Mawco under conditions existing at Whitwell Colliery and yet, in practice, the three machines produced very nearly the same output. Was this a question of machine utilization?

The AUTHOR also stated that figures taken over 17 weeks' duration showed that the Mawco achieved 102 per cent. of the expected output, the shearer 97 per cent. and the trepanner only 75 per cent. If these percentages were applied to the theoretical performances given in Table 6 the tonnages per shift then became 287 for the Mawco, 282 for the shearer, and 275 for the trepanner. Thus, under the conditions operating at Whitwell the value of the product (on the gate belt) produced per shift by the Mawco was considerably greater than that produced by either of the other two machines. Further investigation had shown that the high percentage utilization from the Mawco and the shearer was due entirely to the fact that there was less idle time due to breakdowns and other causes.

MR. R. SCOTT understood from the paper that the plough and the machine underframe were articulated and asked if there were any devices incorporated in the machine to assist in steering.

Replying, the AUTHOR said that, since the machine was mounted on a Panzer conveyor, there was no need to incorporate steering devices in it. All the steering necessary was done by adjusting the conveyor when it was moved over; this was, of course, common practice with the Anderton shearer.

Use of the segmented drum with the Anderton shearer was referred to by MR. W. KNIGHT, who said that this device gave a reduction in machine height of 6 in., which enabled the machine to be flitted back under roof bars which had been advanced behind the machine when cutting. He asked if it were envisaged that the same would be possible with the Mawco.

The AUTHOR said that, under the existing arrangements for collapsing the Mawco frame jib, a vertical displacement of up to 3½ in. could be achieved. This did allow for flitting back when a certain amount of convergence had taken place, but obviously would not allow for the setting of roof bars before the return run had been made. Arrangements were in hand, however, for the manufacture of a frame which would give the same facility as did the segmented drum, *i.e.*, a collapsibility of some 6 in. This frame should be available for underground trials shortly and, if successful, should be generally applied.

MR. D. MARRIOTT asked if there were any specific reason why the two faces quoted had different systems of roof support and was any consideration being given to the addition of a precutting jib to the machine as this might increase the speed of travel.

In reply, the AUTHOR said the link bars were used on the short experimental face because they were the only ones readily available at the time. In order to gain more experience the slide-bar system of support was used on the second face. There appeared to be little to choose between the two methods. With regard to the addition of a precutting jib to the machine, this was not considered advisable at this stage. The essence of the machine, as with the Anderton shearer, was its simplicity, and to complicate it with precutting jibs and other devices would tend to destroy its simplicity and, in turn, its reliability.

MR. G. A. PERCIVAL asked what considerations prompted the depth of cut and was any increase envisaged in this; if so, was it limited by the design of the plough?

The original frame, the AUTHOR replied, had been

deliberately designed with a depth of cut equal to that on a normal Anderton shearer. This had been done so that conversions could take place without disturbing well-tried timbering systems. The second frame was designed to coincide with the depth of cut commonly taken on trepanner faces. Further increases in frame size had been contemplated and, with the advent of higher horsepower machines, no doubt frames giving a greater depth of cut would be tried. At present the plough was not the limiting factor.

MR. J. SMALLEY wondered whether the ash percentage in the dry smalls would be less with the Mawco machine than with the trepanner and what the author expected the results to be like in a seam with dirt bands.

The AUTHOR said that in a seam with dirt bands there would possibly be less dirt in the dry smalls as the dirt bands would not be broken up to the same extent with a Mawco machine as they would with a trepanner. The Mawco would probably be an advantage in a dirty seam, as the dirt should come out of the pit in larger pieces and would be more easily dealt with in the coal preparation plant.

MR. E. MAIDEN asked why the cutter chain was arranged to travel from roof to floor at the back of the cut, and if figures of power consumption were available for the chain cutting in this direction and with it cutting in reverse.

The AUTHOR replied that the cutter chain had been deliberately arranged to travel from roof to floor at the back of the cut in order to reduce airborne dust. With this method of cutting the gummings were delivered from the chain at a point where the body of the machine screened them from the effect of the air current on the face, thus reducing airborne dust. If the chain travelled in the opposite direction the gummings would be thrown in the air, thus producing a dust problem. No comparative figures of power consumption for the two directions of travel were available.

MR. J. L. COLLINSON asked for further details of rope life and whether the operators practiced slacking off the haulage rope as the machine progressed along the face.

In reply, the AUTHOR said that the operator did slack off the rope as suggested. With regard to rope life, when difficulties were being experienced on 33's face the rope life was reduced to as little as 3,000 yd., but with the remedial measures taken and the running out of the swilleys from the face, rope life had returned to normal, which was about 30,000 yd. of cutting.

MR. J. HOUGHTON asked why only Eickhoff and B.J-D machines had been used if this was to be a modification of the Anderton shearer.

The AUTHOR explained that the Eickhoff and B.J-D shearers were the only machines which were manufactured with a drum shaft which was at 90 deg. to the body of the machine. All other makes of Anderton shearer had a drum shaft which was slightly offset from the right angle. The easiest application of the frame jib was to machines which had the drum shaft at right angles to the body of the machine. Eickhoff and B.J-D machines were therefore used in the first instance. At the present time, however, developments were in hand to fit the Mawco jib to machines with an offset drum shaft. The first one of these conversions had been applied to an AB machine and would be ready for working shortly. Now that this design had been accomplished there would be little difficulty in future in fitting the Mawco jib to all types of Anderton shearer machine.

MR. J. SHELDON pointed out that the increased bulk output of 86 tons per machine-shift on the trepanner compared with the Mawco was indicative of the benefits to be gained from a double-ended machine. He asked if the author would indicate whether he considered that the incorporation of this feature in the Mawco was a worthwhile future development.

The AUTHOR replied that from the method studies contained in the paper, the flitting time was just over 30 min. per web. It must be borne in mind, however, that this time was not wholly occupied in flitting, but also in cleaning the face, an operation which had never yet been successfully achieved behind the trepanner. If the machine were to be made double-ended some efficient means must be employed in cleaning the face behind the machine on the cutting operation, this was a considerable stumbling block towards the development of a double-ended machine. The greatest objection, however, appeared to be that to make the machine double ended its simplicity and possibly its outstanding reliability would be destroyed. If these objections and difficulties could be overcome it would obviously be a benefit to make the machine double ended.

MR. B. STEPHENSON, who asked if the saleable output of 41,051 tons turned by the first machine referred to the 64,000 yd. cut by the machine, was told that the tonnage figures referred to those got from the whole of the face.

# USE OF EXPLOSIVES AT QUARRIES

GIVING guidance on the safety requirements laid down by the Regulations governing the use of explosives at quarries, a booklet called "The Use of Explosives at Quarries," has been published by the Ministry of Power (Stationery Office, price 5s. 6d.). In addition to giving guidance on the application of the statutory requirements, the booklet advises on the best practice to be observed to ensure safety. If these precautions are observed, not only will all accidents be avoided but efficiency will be increased.

The text of the Quarries (Explosives) Regulations, 1959, which primarily governs the handling or use of explosives at quarries, is reproduced in an appendix. The greater part of the booklet, containing 35 illustrations, is written with the needs of the shotfirer and other workmen in mind. A section deals with points which particularly concern owners and managements. Among the topics dealt with are types of explosives, the preparation and charging of shotholes, and the firing of shots by various methods.

In the management section the provision of suitable equipment and the choice of appropriate blasting techniques to suit the conditions and needs of the quarry are discussed. Another appendix gives advice on the destruction of explosives which have deteriorated in store.

INDUSTRIAL EDUCATION INTERNATIONAL, 66, Chandos Place, London, W.C.2, announces two two-day working courses on "Planning the Most Effective Factory and Plant Layout." They will be conducted by John D. Wheeler and will be held in London (March 27 and 28) and Manchester (March 29 and 30).

# *Progress at Hunterston*

## FIVE STEAM-RAISING UNITS IN POSITION

FIVE steam-raising-unit shells associated with the first reactor have now been placed on their plinths at Hunterston nuclear generating station. This is the most evident progress made during the past few months at this 300-MW station, which is being built for the South of Scotland Electricity Board by the GEC and Simon-Carves Atomic Energy Group.

Now that these shells are in position a start has been made on the installation of the gas circulators and the tubing inside two of the vessels. In order to do this a "clean conditions" building has been erected on top of each shell so that the plant can be lowered into the interior under rigidly controlled conditions of cleanliness. Some parts of the gas circulators will be installed from beneath the steam-raising units. Much of the structural steelwork in the vicinity of four of these steam-raising units has been erected, enabling the high-pressure and low-pressure steam drums and associated pipework to be mounted in position. It will not be long before this face of the reactor is ready for glazing; indeed, glazing on the adjoining exit building is practically complete.

FOUNDATION STEELWORK OF THE FIRST TURBO-GENERATOR IN COURSE OF ERECTION IN THE TURBINE HALL AT HUNTERSTON.

The hot and cold gas ducting, together with the main valves and expansion bellows units which link the pressure vessel of reactor "A" with the steam-raising units is being connected up. Stress-relieving of the welds involved will be carried out *in situ*. Reactor "A" pressure vessel is being prepared for stress-relief, and about a quarter of the bottom head has been externally lagged with 6-in. thick thermal insulation. Thermocouple points for temperature measurement have already been prepared and a structure for carrying the electric heating elements is being erected. All the control-rod nozzles of this vessel have been welded and are being inspected. About half of the standpipes which will be fitted to these nozzles are on site, but none will be installed until after the pressure vessel has been stress-relieved.

When the reactors are in operation the top inner surface of each vessel is to be cooled by diverting some of the carbon-dioxide coolant gas through a system of pipes, perforated on their upper surfaces, and suspended from the inside of the top head. All these pipes have now been erected inside the first reactor pressure vessel.

It will be recalled that a service machine and crane will be mounted above the top concrete biological shield of each reactor. The civil work of the first reactor has reached the stage which allows erection of the crane and service-machine structure to commence. Testing of the control-rod recovery and handling mechanisms inside the first service machine is in hand at the Erith Works of GEC.

The main activity inside reactor "B" is connected with the fabrication of the pressure vessel. The 340-ton support grid was lifted into position in January and will be followed shortly by course No. 3 of the vessel itself. Good progress is also being made on the construction of the maintenance building for the charge machine which will operate beneath the reactors.

Foundation steelwork of four of the six 60-MW turbo-generators is being erected in the turbine hall, that for sets Nos. 1 and 2 being well advanced, permitting a start to be made on the erection of the first set. Installation of the condenser for No. 1 turbo-generator is finished and a pressure test has been successfully carried out. The first turbine was tested at Erith towards the end of last year and the second is in course of preparation. The

main walls of the cartridge cooling pond having been cast, attention is being directed to the construction of the internal pond walls. Construction of the east and west blockhouses, through which irradiated fuel elements will pass on their way to the pond, is going ahead.

All six of the circulating-water pumps and their 800-h.p. driving motors have now been installed and aligned in the pumphouse situated near the intake works, about a quarter of a mile from the reactors. Adjacent to this pumphouse is a room which will ultimately contain the automatic dosing gear and pumps for delivering chlorine solution to the intake headworks to prevent fouling of the culverts and pipes by marine organisms. Much of this equipment is already installed.

The scheduled criticality date for reactor "A" is August, 1962, and for reactor "B," May, 1963.

# Rotary Hearth Coke Oven

A NEW departure in coke-oven construction is being developed in the United States. The design has already been worked out and an experimental pilot production unit is shortly to be erected. The coke oven, according to Blast Furnace and Steel Plant, December, 1960, has a rotary hearth similar to that used for certain furnaces in the metallurgical industries where it is employed for heating metal prior to rolling, forging, or other processing operations.

The development of the coke oven is a co-operative effort between Salem-Brosius Inc., and the New York Mining & Manufacturing Company, of New York City and Dorchester, Va. These firms plan to build rotary coke ovens of 70 ft. dia.

In adapting the principle to coke production a deep bed of coal is fed onto the hearth, which rotates slowly within a circular shell. Hot gases from the high-temperature zones in the oven are directed to the zone immediately behind the feeding hopper, thus igniting the charge, combustion being supported by air supplied through ports in the periphery of the oven.

As the hearth slowly rotates, carbonizing continues to completion, the coke then being withdrawn and quenched. The process is autogenitic in that no external source of heat is applied to the charge.

The production goal for the 70-ft. dia. coking furnace is stated to be about 5,000 tons of high-grade metallurgical coke per month. The cost per ton of coke produced is expected to be substantially lower than that of other coking processes.

LIGNITE EXTRACTION is expected to begin at Neyveli, in Madras State, in July or August; 2,000 tons will be mined and exported to East Germany and Jamshedpur for commercial tests. Mining operations are at present proceeding in one quarter of the open pit area and a recent report stated that a depth of 140 ft. had been reached. The lignite bed would be touched by excavating another 40 ft.

# FIRE PROTECTION OF STEELWORK

NEW tables showing revised thicknesses of vermiculite/gypsum plaster for fire protection of structural steelwork have been calculated by the Fire Research Station following a fresh series of tests on stanchions and beams carried out in accordance with BS 476:1953. The research programme was undertaken by the Expanded Metal Company, Limited, Burwood House, Caxton Street, London, S.W.1, and Mandoval, Limited.

For the first time ratings for columns and beams are shown separately and it is noted that the thicknesses required for beams are considerably less than for columns. The thicknesses for columns are in turn, less than those previously quoted. For instance, for 4-hr. protection 1¾-in. is now required, whereas previously it was 2¼-in., and for 2-hr. protection ¾-in. instead of 1-in. In the case of the 3- and 4-hr. ratings for column encasement, the metal lath was spaced 1 in. from the face of the flange by means of a light metal channel. The thicknesses of 1¼ in. and 1½ in. therefore are valid only for this form of construction.

In making the computations the Fire Research Station assumed that ¼ in. is the practical minimum thickness and did not, therefore, calculate figures giving a lesser thickness.

In all cases the mixes used were 1½ volumes coarse vermiculite plaster aggregate to 1 volume retarded hemihydrate plaster for the rendering and floating coats, and ½ volume fine vermiculite plaster aggregate to 1 volume retarded hemihydrate plaster for the finishing coat.

# British Standard for Wheel Pairs for Locomotives

A NEW British Standard, "Wheel Pairs for Locomotives and Rolling Stock (Dimensions), Part 3: Tyres (BS 3117: Part 3: 1961), caters for the special requirements of oversea railways as well as the needs of British Railways. The specification gives preferred leading dimensions and contours for finish-machined, rough-machined, and as-rolled locomotive, carriage, and wagon tyres suitable for wheel centres conforming to Part 2 of BS 3117. A list of preferred sizes for diameter on tread, internal diameter, thickness, and width is included. Tolerances necessary for the satisfactory fitting of the tyre on the wheel centre are given.

Publication of this standard completes the set of British Standards for components of wheel pairs for locomotives and rolling stock. Part 1 for axles, Part 2 for wheel centres and monobloc wheels, Part 4 for the Gibson ring-type fastening, and Part 5 for machining and assembly have already been issued.

Copies of the new standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1 (price 4s. 6d., postage extra to non-subscribers).

# *Steel Output Rate as Per Cent. of Capacity*

## USEFULNESS QUESTIONED IN UNITED STATES

TECHNOLOGICAL revolution in the United States has recently dealt a severe blow to what hitherto has been regarded as the best way to check the health of the steel industry. For years, steel production as a percentage of capacity, often called the "operating rate" or "ingot rate," was the method of gauging the activity of a company, a steelmaking district, or of the industry as a whole. That is no longer true, although it was the only thermometer in use when this article was contributed by G. F. Sullivan to Iron Age, December 15, 1960. It is now under attack within the industry, though it still has its supporters. The problem was on the agenda of a recent meeting of steel industry executives, but, for reasons outlined here, the controversy is likely to continue. Certain factors have recently combined to bring this subject to a head.

For some time it has been contended that the industry lacked capacity to meet international emergencies. This led many concerns to leave on books furnaces whose capacities on a commercial basis would have been written off. Part of the 24,000,000-ton expansion of capacity from 1950 to 1954 was based on this "defence-standby" theory. Output of 111,600,000 ingot tons in 1953 pushed the industry to 94.9 per cent. of rated capacity, but four years later, in 1957, a 112,700,000-ton output was equivalent to an operating rate of only 84.5 per cent.

### Mr. Kennedy's Campaign

Another factor bringing "capacity" into prominence was the campaign of the then US President-elect, Mr. Kennedy, in which he made references to steel operations at 50 per cent. of capacity, which were never rebutted by the Republicans, possibly because of the rather high unemployment in the industry. Steel leaders cringed at these statements, but privately they felt that 100,000,000 tons of steel was, in fact, a likely figure for 1960, making the year one of the six best output records in history.

The problem of "capacity" became definitely confused by technological developments in recent years. Up to that time steelmaking practice was almost uniform, a condition which no longer applies. Improvements in blast-furnace practice including ore beneficiation, sintering, and so on, mean more efficient iron production with higher hot-metal-to scrap ratios resulting in reduced open-hearth heat times. Furnace roofs now last twice as long as previously, with corresponding reduction in down-time.

Probably the most important factor influencing furnace capacity is the increasing use of oxygen. Not only has it displaced former ideas of open-hearth heat times, it has moved in on its own with the oxygen converter. One plant, for instance, will install two 300-ton basic oxygen converters this year, rendering idle a five-furnace open-hearth shop. But the open-hearths will be on standby, with little hope of their ever being used commercially. Should they be included in capacity?

The "capacity" of a furnace, a shop, or even a plant, is not something arrived at by multiplying absolute numbers. Some factors are fixed: hours, number of furnaces, and so on. Other factors, like time lost in relining, are somewhat variable; they change with improved technique. But the greatest variable is net tons per operating hour. This introduces the experience and the judgment of as many people as there are plants; and no two people think exactly alike in an era of changing and expanding technology.

The US steel industry rated its capacity for 1960 at 148,600,000 tons. But it was suggested, towards the end of last year, that between 5,000,000 and 10,000,000 tons of this could be written off as far as commercial availability was concerned. That itself would revise operating rate upward by a few points. But it is quite possible that the steel industry of the United States could produce, this year, not merely its rated capacity of 148,600,000 tons, but at a rate of 170,000,000 tons without adding a single furnace if the orders were there in the right products and prices. All this leads some steelmakers to assert that there are now so many imponderables in "capacity" that it is no longer a reliable figure, and they would like to see it abandoned. Opponents, on the other hand, claim either that it is still of some value or that it cannot be dropped unless something clear and understandable replaces it.

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A ONE-DAY WORKING SEMINAR on "Clear Technical Writing" will be conducted in Manchester (April 10), Birmingham (April 12), and London (April 13) by Robert Gunning, an authority on writing and readability. Registration forms may be obtained from the Industrial Education International, 66, Chandos Place, London, W.C.2.

## The 250-Guinea Photograph

THIS photograph of a KL Super 40 loading a lorry on the harbour wall at West Bay, Bridport (Dorset), was taken by Mr. W. Rodber, a local government officer, of Greenway Road, Taunton (Somerset), and it won him an award of 250 guineas. This was the first prize in the Jones crane photographic competition.

The judging panel, under the chairmanship of Mr. A. L. M. Sowerby, editor of the Amateur Photographer, consisted of Mr. Percy R. Levy, a director of the George Cohen 600 Group, Limited, the sponsors, and himself a keen photographer, and Mr. P. Hodge, senior staff photographer of K & L Steelfounders & Engineers, Limited, the 600 Group company which manufactures Jones cranes.

The panel felt that Mr. Rodber's photograph was a well-balanced composition in which the human element—the slinger and his mate—lent force and a sense of life to the picture's story.

Second prize of 100 guineas went to Mrs. G. Underell, of London, S.W.6, whose picture, taken at Albert Embankment, shows a lorry-mounted KL 66 handling a motor launch. The 75-guinea third prize was awarded to Mr. B. Turpin, of Stanford-le-Hope (Essex). Taken in Hyde Park, his photograph is an original and unusual view of a KL 15 showing the jib and controls as a modernistic design against the sky. There was a fourth prize of 50 guineas and five consolation prizes.

# *Book Review*

**The Determination of Gases in Metals.** Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1. 308 pp. £3 3s.

ONE occasionally hears comments about the lack of textbooks covering rapidly developing scientific techniques. The problem here, of course, is that the time taken to produce a complete volume is such that, when it is eventually published, a lot of the content can be out of date. This difficulty is largely overcome with a symposium and, if for this reason alone, the Society for Analytical Chemistry, the Iron and Steel Institute, and the Institute of Metals are to be congratulated on organizing a joint meeting on the determination of gases in metals and publishing the complete papers and discussion in a very pleasing form. In the foreword, Mr. R. C. Chirnside comments that "it is of particular interest to note that . . . the ferrous and non-ferrous interests have been brought together, it is hoped to their mutual benefit." One cannot but echo this wish.

The subject matter and, indeed, the fact that the symposium was held, reflect the increasing interest in the effects of small amounts of gases in metals, particularly in steel. The three gases oxygen, nitrogen, and hydrogen are dealt with, and there are reviews on the determination of each of these gases. The methods of analysis described in detail are vacuum and inert gas fusion, chemical analysis, carrier gas techniques, activation analysis, emission spectrometry, isotope dilution, X-ray emission analysis, and internal friction methods.

Apart from the virtues already referred to, each paper is by an expert in his field, and the book is to some extent a bibliography. Altogether, over 600 references are cited (although there is doubtless some repetition) and these will be of considerable value to anyone with the temerity to delve even deeper into the subject.

There is no doubt that this book will find its place in many steelworks' laboratories. Is it sufficient to say that it is never likely to remain untouched for long enough to collect much of the inevitable dust?

# Research on Tin

ACTIVITIES of the institute at Perivale (Middx) and of its offices in the US, Canada, and six European countries are covered by the Tin Research Institute's annual report for 1960. The institute took a part in organizing the commemoration of the 150th anniversary of canned foods, while technical conferences on various applications of tin in industry were held in Paris, Brussels, and Brunswick (Germany) during the year. Some thousands of industrial users of tin received technical advice and help.

The report deals with the progress of the researches in the various departments of the institute. Among the new lines of work mentioned are:—Tin as a deliberate addition to steel and also in cast iron; aluminium-tin bearings; studies on tin-titanium-oxygen and on tin-titanium alloys; the structure of electrodeposited alloys; bright electrotin deposits; the reactivity of surface zones in steel strip used for tinplate; the influence of tin on the hardness of silver, and discoveries in the field of organotin chemistry.

Copies of the report are available from the Tin Research Institute, Fraser Road, Perivale, Greenford (Middx).

# Surface Control System for Mine Cars

A NEW fully automatic system for the control of mine cars at the surface has been developed by the English Electric Company, Limited. The system has been designed for removing mine cars from a cage, tipping and returning them completely automatically.

For the control and sequencing of all operations, transistorized logical elements and contactless sensing devices from the "Unistat" range of static equipment are used. Having no moving parts, they ensure practically maintenance-free operation and are more reliable than conventional relays and auxiliary contacts. When maintenance is necessary standard units can easily be replaced. Systems of any size and complexity can be built and the complete control system is also more compact.

### Demonstration of Circuit Layout

A model mine-car circuit controlled by full-size equipment with the exception of miniature proximity sensing devices was demonstrated at the recent ASEE (Electrical Engineers) Exhibition at Earls Court. A typical mine-car circuit layout, similar to that shown in Fig. 1, was chosen for the model. It consists of a tower-mounted friction winder with balanced two-deck cages (each cage holding one mine car), "fulls" and "empties" traversers, tippler, and rams.

When a full mine car has been wound to the surface it is rammed out of the cage by a ram, which pushes forward an empty mine car. As the cage descends with the empty car, the full car gravitates onto a traverser trolley. This is driven up a slight incline so that the car can gravitate off the trolley and into the tippler.

The tippler turns the car through 360 deg., emptying its contents onto a conveyor belt or hopper underneath. The car, now empty, gravitates onto the trolley of the "empties" traverser, is again driven up a slight incline to a point directly opposite the cage it has to enter, gravitates off, and is rammed to complete the circuit.

This sequence of operation follows one car, but there are, of course, several cars in the circuit at one time. A car must therefore complete an operation in a section of the circuit before another can enter that section. For reliable interlocking the positions of the mine car are detected by proximity heads. These contactless sensing devices detect the presence of a ferrous material within their operating zone.

The signal produced by the head is then fed into the "Unistat" transistorized logical elements and these elements are responsible for the sequencing and control. The output from the element is then amplified further and this signal is used to operate the motor starter, solenoid, or contactor as necessary.

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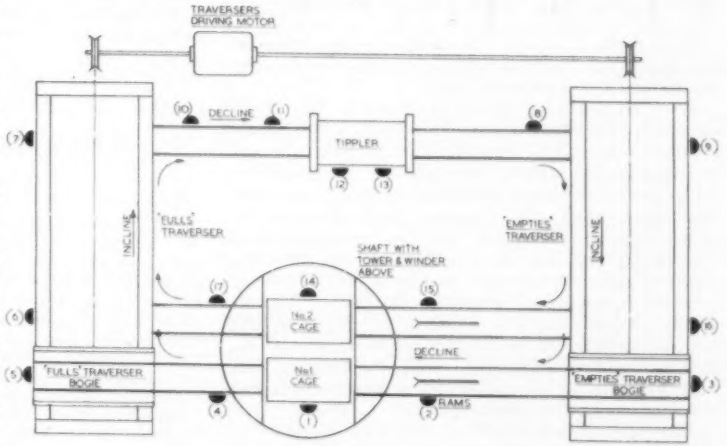
IRON AND STEEL PRODUCTION in Japan in 1960 was a record, averaging a 30 per cent. increase over 1959, according to the Far Eastern Economic Review. Pig-iron output was 11,897,000 tons, crude steel 22,143,000 tons, ordinary rolled steel products 15,355,000 tons, and special rolled steel 1,165,000 tons. The industry was operating to capacity during the second half of the year.




PROXIMITY HEADS
(1) No.1 CAGE IN LINE
(2) CAR ON No.1 RAM
(3) BOGIE IN LINE WITH No.1 TRACK
(4) CAR CLEAR OF No.1 CAGE
(5) CAR FROM No.1 CAGE ON BOGIE
(6) CAR FROM No.2 CAGE ON BOGIE
(7) BOGIE IN LINE WITH TIPPLER
(8) CAR ON ARRESTER
(9) CAR ON BOGIE
(10) CAR CLEAR OF BOGIE
(11) CAR IN TIPPLER
(12) TIPPLER IN LINE
(13) TIPPLER PARTIALLY ROTATED
(14) No.2 CAGE IN LINE
(15) CAR ON No.2 RAM
(16) BOGIE IN LINE WITH No.2 TRACK
(17) CAR CLEAR OF No.2 CAGE

FIG. 1.—TYPICAL MINE-CAR CIRCUIT.

## FILM REVIEW

# *Powered Roof Supports*

ALTHOUGH complete automation at longwall faces may never be possible, every step towards it improves productivity. The combination of the power-loader, armoured face conveyor, and hydraulic props is now standard practice, but the weakness remains that as machine speeds increase, more and more men may be needed to keep the roof supports advanced behind the rapidly moving power loader.

To overcome this weakness, self-advancing roof supports have been developed and a recent film, with a running time of 28 min. and made by the National Coal Board's Technical Film Unit, surveys the main types that were available during 1960.

### Installation at Cortonwood

Gullick self-advancing chocks, used in conjunction with a trepanner, are illustrated by the use of a model, and views of an installation at Cortonwood Colliery in the NCB's North-Eastern Division show the self-advancing supports under operational conditions. The chocks are also shown used in conjunction with the Anderton shearer loader in a surface layout. A feature of this demonstration is the use of the three-leg Gullick chocks with a goalpost between them. With these new chocks the cantilever bars, while remaining under hydraulic pressure, can adjust themselves to unevenness of roof.

The surface layout also shows the Gullick four-leg chock, with a fifth leg to give additional support to the cantilever bar.

Both models and the installation of the lump shearer at Pye Hill Colliery in the East Midlands Division are used to demonstrate the Dowty Roofmaster support system. Models are used to illustrate the full sequence of operations from the cutting run, after which the two-leg props advanced to support the newly exposed roof at a setting load of 9 tons per leg, to the advance of the three-leg supports after the conveyor has been snaked over.

Another sequence illustrates the Dowty Roofmaster Minor, which is a system of self-advancing chocks, designed to accommodate itself to unevenness in the roof and floor. The chocks have four legs, but instead of supporting a canopy, the legs are in pairs, each supporting a bar.

The Desford Gull Wing powered support is shown controlling the roof of a shearer face at Markham Colliery in the East Midlands Division. Each powered support consists of two 50-ton chocks.

The front chock carries on each side "gull wings," which are cantilevers extended forward over the conveyor and backward to the rear chock. These "gull wings" are powered by hydraulic capsules, which allow a loading at the tip of the cantilever of 1½ tons. The main load on the front chock is carried, as on the rear chock, by a strong roof bar.

A model shows the moving over operation of these chocks during the flitting of the power loader. The front chocks are not connected by rams, but are used to push bodily against the conveyor during the moving-over operation.

The Dobson "Double Two" system is shown to consist of two chocks, a master and slave, coupled together by a double-acting ram, so that they can be advanced independently of the conveyor. An intensifier is built into the hydraulic system and this is demonstrated by one of the support units in a test rig. As a load of 5 tons is brought down on the cantilever bar, which slowly yields, the load taken by each leg automatically builds up to 25 tons.

A sequence is shown of the Double Two chocks in use with a shearer loader at Barrow Colliery, Barnsley. Though the face is fully caved, a special system has been evolved for the support of the gate-side packs. Rear bars are cantilevered behind the master chocks, as well as in front, and the 4-ft. 6-in. spaces between them are treated as sections and packed one after the other, leaving the bars to be withdrawn by the chocks when they are moved forward.

The film concludes with reference to the progress being made in the development of completely automatic chocks, and shows a device, developed by the NCB's Mining Research Establishment, to determine electronically the position of every working part of every chock in a face and indicating faulty operation.

The automatic operation of rams is also demonstrated by the operation of a further device which controls the hydraulics, enabling one chock to initiate the advance of the next.

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# Dust Explosions in Factories

TWO types of commercially developed isolation valves for limiting the spread of a dust explosion in factory plant have been tested on a field scale. The results are described in SMRE Research Report No. 194 by K. C. Brown and G. E. Curzon.

In a system incorporating the isolation valve, a detector, sensitive to pressure and a low rate of pressure rise, is attached to a part of the plant in which explosions are more likely to arise; when an explosion occurs the increasing pressure causes the detector to trigger the closing of one or more quick-acting valves in the connected ducting, thus isolating the parts of the plant beyond the valves.

The tests were carried out in an experimental rig consisting of a 50-cu. ft. vessel, to which the detector was attached, and a length of 10-in. dia. duct on which a valve was fitted at a distance of about 24 ft. from the vessel.

Dust explosions were initiated in the vessel and the behaviour of the system was studied under various conditions.

# Metallurgical Patents in the US

## *Some Recent Inventions*

DESCRIPTIONS of metallurgical patents given below have been taken from details published in the Official Gazette of the United States Patent Office.

### Teeming Nozzle Valve for Vacuum Casting Apparatus

A vacuum casting apparatus, includes a tank to be evacuated, a casting mould in the tank, a ladle for molten casting metal, a teeming nozzle in the bottom of the ladle providing a downwardly opening orifice for the flow of metal from the ladle into the mould, and a stopper rod at the upper end of the nozzle controlling the flow of metal through the orifice. A stationary valve takes the form of a metal plate having a vacuum sealing connection with the ladle about the lower end of the nozzle and a valve port in the plate. A second valve is mounted for movement to and from a closed position in which it has vacuum seating engagement in the valve port and renders the plate effective as a vacuum seal between the orifice and tank. Means provide for actuating the second valve part to its open position in response to upward opening movement of the stopper rod to provide an evacuating connection between the orifice and tank.—2,962,779.

### Metal Casting Apparatus

A casting apparatus comprises a mould having a cavity in which metal is to be cast, a feed chamber arranged along one side of the cavity, a narrow elongated and vertically extending gating opening providing a communicating connection between the chamber and cavity, the opening having laterally spaced and vertically extending edges. The chamber has planar sidewalls diverging outwardly from the vertical edges of the opening, and a sprue opening into the bottom of the chamber at a point remotely located with respect to the lower end of the opening, the sidewalls being spaced apart at the widest dimension of the chamber a distance not substantially greater than the diameter of the sprue. The vertical edges of the gating opening diverge relative to each other in an upward direction.—2,962,780.

### Apparatus for Removing Metal from Crucibles

An apparatus for removing metallic sponge from a crucible has a central longitudinal axis, comprising a base, and means for rotatably supporting the crucible about the axis at an inclined position with respect to the base. With the mouth of the crucible lowermost, a rotary cutting tool is mounted for insertion, the rotational axis of the cutting tool being in spaced parallel relation to the longitudinal axis of the crucible during operation. Provision is made on the base to rotate and axially move the cutting tool into the crucible, a receptacle being adapted to receive falling particles from the crucible upon their removal by the advancing cutting tool. Means seal off the cutting tool, and receptacle from the atmosphere and yet permit communication between the crucible and the receptacle, whereby the metallic sponge may be removed in a reduced or inert atmosphere.—2,963,725.

### Process for Treating Metals and Product

A process for treating material having a zinc surface to improve corrosion resistance comprises immersing the material in a body of treating solution consisting essentially of an aqueous solution of zinc nitrate and chromic acid having a molar ratio of zinc nitrate to chromic acid between 4:1 to 1:9 to produce a corrosion resistant film on the zinc surface. The solution must be free of any substance which is a reducing agent for chromate ion. At least the zinc surface of the material to be treated must initially be at a temperature substantially above room temperature and less than about 450 deg. F. On removing the treated material from the body of solution, it is subjected to an aqueous rinse to remove excess treating solution, thus producing a substantially colourless corrosion resistant film on the zinc surface.—2,964,432.

### Process for Inhibiting Corrosion and Product

A process for treating material having a zinc surface to improve corrosion resistance comprises bringing a solution consisting essentially of at least one compound which is a source of zinc ion and at least one compound which is a source of chromate ion dissolved in a volatile solvent into intimate contact with the zinc surface of the material, the solution being free of a substance which is a reducing agent for chromate ion and containing a ratio of zinc ion to chromate of 9:1 to 1:9.5. The zinc surface to be contacted with the solution is to be initially at a temperature substantially above the boiling point of the solvent and below the melting point of zinc, the volume of solution contacted with the zinc surface being controlled and the temperature of the zinc surface being sufficiently elevated so as to volatilize the volatile components of the solution substantially immediately after contact thus producing a substantially colourless corrosion resistant film on the zinc surface.—2,964,433.

### Pickling and Rust-inhibiting Bath for Ferrous Metals and Use of Same

A method of pickling and inhibiting the rusting of the surface of a ferrous metal article in a single bath comprises: immersing the article in a heated pickling and rust-inhibiting bath having a pH not greater than 1 and which contains a minor proportion of a pickling acid equivalent to not more than about 20 per cent. concentrated acid from the group consisting of sulphuric acid, phosphoric acid, and admixtures thereof, and which contains at least about 0.4 per cent. by weight of a boron-phosphate rust inhibitor having a mole ratio of phosphorus to boron of at least 1 to 1 and not more than about 17.3 to 1; and removing the pickled and rust-inhibited article from the bath.

### Apparatus for Determination of Oxygen in Metals

Apparatus for determining oxygen in metals includes an electrical resistor furnace comprising a shell, a plurality of upstanding graphite legs within the shell each connectable to a lead of an electrical power source, a graphite crucible supported by the graphite legs, with means for introducing an oxygen-containing metal

sample into the crucible which when heated converts the oxygen content of the sample to carbon monoxide. A pump transfers the carbon monoxide from the crucible into a calibrated collection space. Means provide for enclosing the collection space, a portion of the space being selectively enclosed by one of a pair of absorption trains, each of the trains comprising a carbon monoxide absorption bulb disconnectable from the train, a cold trap, and a pressure measuring instrument. Intermittent selective isolation of one of the pair of absorption trains from the remainder of the apparatus is possible and means provide for evacuating the collection space including the other of the pair of absorption trains while the one of the pair of absorption trains is isolated therefrom.—2,964,389.

### Automatically Adjusted Orifice Plate Blast-furnace Gas Cleaner and Back-pressure System

A blast-furnace gas-cleaning apparatus, comprising a gas main connected with the top of a blast furnace for off-flow of top furnace gas, has an upright conduit section with a rate-of-flow controlled constricted orifice therein of greater length than width and of constant width throughout its length. Means provide for supplying cleaning liquid to the conduit section to flow with the gas through the orifice. Oppositely disposed orifice closing panels are mounted for movement toward and from each other lengthwise of the length of the rate-of-flow orifice for varying the effective length of its free area. Means provide for manipulating the panels in their movements toward and from each other, and for actuating the manipulating means in accordance with changes in rate of gas flow from the furnace top to the orifice to maintain a predetermined constant pressure drop across the orifice notwithstanding variation in the rate of gas flow. Regulating means responsive to changes in the pressure differential across the orifice are operatively connected with the actuating means, operation of which is in accordance with changes in rate of gas flow through the orifice.

A back-pressure regulating constricted orifice is in series in the conduit section with the rate-of-flow constricted orifice and likewise of greater length than width and of constant width throughout the length of the orifice. Oppositely disposed orifice closing panels are mounted for movement toward and from each other lengthwise of the length of the back-pressure orifice for varying the effective length of the free area of the orifice. Provision is made for manipulating the panels in their movements toward and from each other, while means provide for actuating the manipulating means in accordance with changes in the gas pressure at the top of the blast furnace to maintain a predetermined back-pressure therein. Also regulating means responsive to changes of the top furnace gas pressure and operatively connected with the actuating means regulate the operation of the actuating means for the panels for the back-pressure orifice by, and in accordance with top changes in gas pressure at the furnace.—2,964,304.

### Apparatus for Charging Low-shaft Arc Furnaces

In combination with a low-shaft electric reduction furnace wherein gases are liberated during final reduction of a charge, ore pre-reduction means include a cylindrical chamber mounted for rotation about its longitudinal axis inclined at an acute angle with respect to the horizontal. A plurality of agitating vanes on the interior of the chamber are disposed in a spaced apart relation with respect to each other. Means provide for introducing ore to the upper end of the chamber whereupon the ore will be conveyed by the agitating vanes to the lower end of the chamber upon rotation. A nozzle extends through the upper end of the chamber at a point below where the ore is introduced, whereby the ore passes the nozzle as it enters the chamber. An oven heats coal in a reduced atmosphere to produce coke and coal gas, while a kiln receives limestone. Conduit means conduct a first portion of the furnace and coal gases to the nozzle which directs the furnace and coal gases against the ore to effect pre-reduction. The conduit means also conducts a second portion of the furnace and coal gases to the kiln for preheating the limestone. Means provide for venting the lower end of the chamber whereby the gases therein travel in the same direction as the ore. A hermetically sealed furnace charging appliance is connected to the lower end of the chamber and to a kiln and oven, while means provide for conveying the pre-reduced ore, the coke, and preheated limestone to the furnace.—2,964,308.

### Furnace Apparatus for the Reduction of Metallic Ores

A rotary furnace for the reduction of metal ore through hydrogen-containing gases, comprises a sloping rotary furnace, a cylindrical jacket extending throughout its length and periphery and the ends of which register substantially with the ends of the rotary furnace. A roasting chamber forms an extension for the furnace body at its upper end, the length of which is equal to about one third of the length of the furnace body. The extension opens into a chimney. Means provide for feeding ore into the upper end of the extension, and for feeding continuously a large body of cold air into the lower end of the jacket to constrain the air to move upwardly in a direction opposed to the downward movement of the ore through gravity. The reducing gases are fed into the lower end of the furnace body, a lining of refractory heat-insulating bricks extending over the two upper thirds of its body. A lining of heat transmitting refractory material encloses the lower third of the furnace body, and means constrain the air arriving at the upper end of the jacket to flow back directly into the upper end of the furnace body to burn the residual gases formed through the reduction of the ore by the reducing gases in the furnace body.—2,964,309.

## Sweden's Record Iron-ore Exports

SWEDEN'S iron-ore exports reached an all-time peak of about 20,000,000 tons in 1960, compared with 15,600,000 tons in 1959, according to Mr. Jonas Nordenson, head of Malmexport, the joint sales company of the LKAB and Grängesberg mining concerns.

The peak figure was reached despite record deliveries to the home market and represents in value about 8 per cent. of Sweden's overall exports.

Most of the 1961 output has already been placed under contracts concluded last autumn and foresees somewhat larger quantities than in 1960.

### Natural Resources in Scotland

Since the three-day symposium on Natural Resources in Scotland, held in October/November, 1960, the Scottish Council (Development and Industry) has been engaged in following it up. The material, consisting of the papers, verbatim account and supplementary written papers, are being prepared for publication and it is hoped to have the volume ready by June.

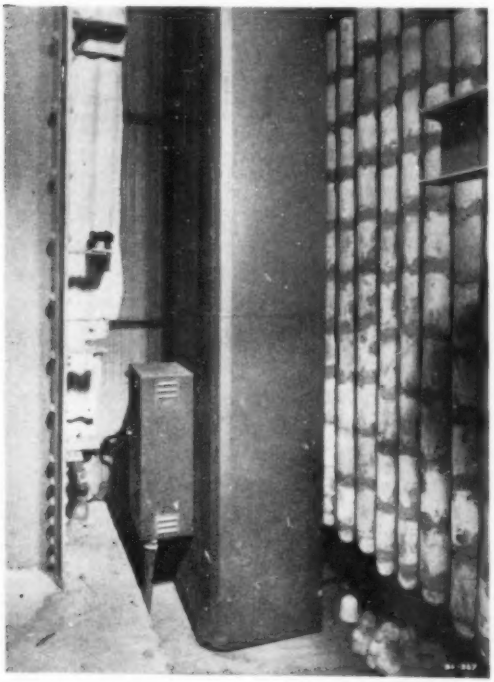
# INFRA-RED PLANT

## Prevents Loss of Molten Metal

AN infra-red plant for the drying of stoppers for 90- to 150-ton ladles at the Clydesbridge Steel Works of Colvilles, Limited, Cambuslang, has been devised by the General Electric Company, Limited. In the past, many pounds worth of molten metal has run to waste when stoppers for 90- to 150-ton steel ladles have exploded. Explosions have resulted from the improper drying and subsequent expansion of the cement that joins the short lengths of cylindrical shaped ceramic bricks forming the stoppers.

Standard sheathed wire element reflector units in a vertical sheet-metal casing make up the infra-red drying plant, which has a loading of 56 kW. As the stoppers are made, they are lifted upright by a small electric hoisting block and onto a moving conveyor. Up to 90 stoppers can be carried on the conveyor which takes them into the oven, three at a time, for a 20- or 30-min. drying period, depending on the diameter of the stopper. The completely dry ladle stoppers are lifted from the conveyor by an overhead crane and placed directly inside the ladle in which they are to be used.

Previously, the stoppers were hung near the furnaces to dry, or placed in an inefficient and uneconomic gas-heated oven. Apart from the cement often drying unevenly, these methods were also much slower.



LADLE STOPPERS ENTERING THE GEC INFRA-RED DRYING PLANT.

## ISI's Joint Meeting in Sheffield

JOINT meeting of the Iron and Steel Institute, the Sheffield Metallurgical Association, and the Sheffield Society of Engineers and Metallurgists is being held at the Engineering Lecture Theatre, The University, St. George's Square, Sheffield 1, from 2.15 to 6.00 p.m. on April 12. Four research papers from the British Iron and Steel Research Association (all published in the Journal of the institute) are to be presented and discussed.

The papers for discussion are:—"The Effect of Heat Treatment and Microstructure on the High-temperature Ductility of 18 per Cent. Cr—12 per Cent. Ni—1 per Cent. Nb Steels," by K. J. Irvine, J. D. Murray, and F. B. Pickering (United Steel Companies, Limited); "Some Ductility Aspects of 18-12-1Nb Steel," by R. J. Truman and H. W. Kirkby (Brown Firth Research Laboratories); "Heat-affected Zone Cracking in Welded High-temperature Austenitic Steels," by R. N. Younger and R. G. Baker (British Welding Research Association); "Microstructural Causes of Heat-affected Zone Cracking in Heavy Section 18-12-Nb Austenitic Stainless Steel Welded Joints," by N. E. Moore and J. A. Griffiths (Associated Electrical Industries (Manchester), Limited).

The meeting is open to all members of the three societies and their guests. Admission to the meeting will be by ticket only. Those wishing to attend should apply to the Secretary, Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1, not later than April 5.

ALL THE ISSUED CAPITAL of Metal Recoveries Pty., Limited, the Australian subsidiary of an American company, has been acquired by Associated Minerals Consolidated, Limited, which has thereby acquired mineral deposits adjacent to the company's areas at Cudgen, New South Wales, a small operating plant, contracts for the supply of minerals, and stockpiles of mineral concentrates.

# Pig-iron and Steel Production

IN the following United Kingdom pig-iron and steel statistics, issued jointly by the Iron and Steel Board and the British Iron and Steel Federation, Table 1 gives the production of pig-iron and ferro-alloys and the number of furnaces in blast in January. Table 2 gives the production of steel ingots and castings in January and Table 3 gives details of finished steel in December last. Activities of the industry are summarized in Table 4.

TABLE 1.—*Weekly Average Production of Pig-iron and Ferro-alloys in January, 1961.* (*Thousands of Tons.*)

| District. | Furnaces in blast. | Hematite. | Basic. | Foundry and forge. | Ferro-alloys. | Total. |
|---|---|---|---|---|---|---|
| Derbys, Leics, Notts, Northants, and Essex | 20 | 1.6 | 31.2 | 17.5 | — | 50.3 |
| Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches | 7 | — | 25.7 | — | 1.1 | 26.8 |
| Yorkshire (excl. N.-E. Coast and Sheffield) | — | — | — | — | — | — |
| Lincolnshire | 10 | — | 48.6 | — | — | 48.6 |
| North-East Coast | 18 | 2.6 | 64.0 | — | 1.3 | 67.9 |
| Scotland | 7 | 1.5 | 23.0 | 1.6 | — | 26.1 |
| Staffs, Shrops, Worcs, and Warwicks | 5 | — | 10.0 | 0.9 | — | 10.9 |
| South Wales and Monmouthshire | 10 | 2.5 | 51.4 | 1.0 | — | 54.9 |
| Sheffield | 2 | — | 3.2 | — | — | 3.2 |
| North-West Coast | 8 | 17.5 | — | 1.2 | 1.1 | 19.8 |
| Total | 87 | 25.7 | 257.1 | 22.2 | 3.5 | 308.5 |
| December, 1960 | 86 | 23.5 | 256.5 | 21.7 | 4.3 | 306.0 |
| January, 1960 | 81 | 22.1 | 246.6 | 26.6 | 2.2 | 297.5 |

TABLE 3.—*Weekly Average Deliveries of New Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

| Product. | 1959. | 1961. | 1959. | 1960. | |
|---|---|---|---|---|---|
| | | | Dec.* | Nov.* | Dec. |
| *Non-alloy steel:* | | | | | |
| Ingots, blooms, billets, and slabs‡ | 5.1 | 5.6 | 5.1 | 6.4 | 5.2 |
| Heavy rails | 6.8 | 8.7 | 6.9 | 8.4 | 8.6 |
| Sleepers | 0.6 | 0.8 | 0.2 | 0.8 | 1.0 |
| Fishplates and soleplates | 0.4 | 0.6 | 0.4 | 0.6 | 0.7 |
| Plates, 3 mm. thick and over- | | | | | |
| (i) Over ⅛ in. thick | 24.8 | 30.9 | 26.5 | 35.2 | 35.2 |
| (ii) Under ⅛ in. | 18.3 | 22.0 | 18.3 | 22.3 | 22.8 |
| Other heavy prods. | 41.2 | 53.1 | 48.8 | 54.8 | 51.4 |
| Ferro-concrete bars | 9.6 | 12.0 | 10.0 | 12.6 | 11.3 |
| Wire rods | 23.5 | 28.6 | 25.5 | 31.6 | 28.2 |
| Arches, etc. | 7.8 | 7.9 | 6.4 | 7.8 | 6.6 |
| Other light sections | 33.0 | 41.3 | 38.9 | 45.0 | 39.7 |
| Bright steel bars | 7.6 | 9.7 | 8.5 | 9.6 | 8.3 |
| Hot-rolled strip | 27.4 | 33.1 | 28.7 | 35.5 | 29.8 |
| Cold-rolled strip | 8.0 | 10.0 | 8.9 | 10.6 | 9.1 |
| Sheets, incl. coated: | | | | | |
| (i) Hot rolled | 11.8 | 12.9 | 12.1 | 13.8 | 10.2 |
| (ii) Cold reduced | 35.2 | 40.6 | 34.8 | 42.6 | 35.8 |
| Tinplate: | | | | | |
| (i) Hot dipped | 7.7 | 8.0 | 8.5 | 7.3 | 5.7 |
| (ii) Electrolytic | 13.2 | 14.4 | 13.8 | 15.2 | 11.8 |
| Blackplate | 0.7 | 0.9 | 0.7 | 1.0 | 0.7 |
| Tubes up to 16 in. | 20.6 | 23.8 | 22.1 | 23.7 | 22.9 |
| Tube fittings, etc. | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Tyres, wheels, and axles | 2.4 | 2.4 | 2.0 | 2.4 | 2.3 |
| Forgings (excl. drop) | 2.1 | 2.2 | 1.9 | 2.3 | 2.5 |
| Steel castings | 3.6 | 4.3 | 3.7 | 4.5 | 4.6 |
| Tool steel | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 |
| Total | 312.0 | 374.4 | 333.3 | 394.7 | 355.1 |
| *Alloy steel* | 18.2 | 22.5 | 19.5 | 23.6 | 22.3 |
| Total deliveries from UK prod.† | 330.2 | 396.9 | 352.8 | 418.3 | 377.4 |
| *Add:* Imported finished steel | 7.1 | 19.1 | 8.1 | 10.0 | 11.2 |
| | 337.3 | 416.0 | 360.9 | 428.3 | 388.6 |
| *Deduct:* Intra-industry conversion§ | 47.6 | 56.4 | 49.2 | 59.7 | 49.3 |
| Total new material | 289.7 | 359.6 | 311.7 | 368.6 | 339.3 |

† Includes finished steel made from imported ingots and semis.
‡ Other than for conversion into any other form of steel listed.
§ Material for conversion into other products also listed in this table.

TABLE 2.—*Weekly Average Production of Steel Ingots and Castings in January, 1961.* (*Thousands of Tons.*)

| District | Open-hearth. | | Bessemer. and LD. | Electric. | All other. | Total. | | Total ingots and castings. |
|---|---|---|---|---|---|---|---|---|
| | Acid. | Basic. | | | | Ingots. | Steel for castings. | |
| Derbys, Leics, Notts, Northants, and Essex | — | 4.4 | 15.2(basic) | 2.6 | 0.1 | 20.8 | 1.5 | 22.3 |
| Lancs (excl. N.-W. Coast), Denbighs, Flints, and Cheshire | 1.4 | 41.0 | — | 5.8 | 0.3 | 47.1 | 1.4 | 47.1 |
| Yorkshire (excl. N.-E. Coast and Sheffield) | | | | | | | | 1.4 |
| Lincolnshire | — | 48.7 | — | — | 0.1 | 48.7 | 0.1 | 48.8 |
| North-East Coast | 1.0 | 94.5 | — | 1.6 | 0.4 | 95.4 | 2.1 | 97.5 |
| Scotland | 1.0 | 45.1 | — | 2.4 | — | 46.8 | 1.7 | 48.5 |
| Staffs, Shrops, Worcs, and Warwicks | — | 28.6 | — | 3.8 | 0.8 | 31.2 | 2.0 | 33.2 |
| South Wales and Monmouthshire | 2.3 | 88.4 | 18.4(basic) | 0.8 | 0.2 | 109.6 | 0.5 | 110.1 |
| Sheffield (incl. small tonnage in Manchester) | 8.2 | 38.8 | — | 14.6 | 0.4 | 59.9 | 2.1 | 62.0 |
| North-West Coast | 0.1 | — | 6.5(acid) | 0.9 | — | 7.3 | 0.2 | 7.5 |
| Total | 14.0 | 389.5 | 40.1 | 32.5 | 2.3 | 466.8 | 11.6 | 478.4 |
| December, 1960 | 12.0 | 367.0 | 38.7 | 31.4 | 2.0 | 439.9 | 11.2 | 451.1 |
| January, 1960 | 12.6 | 386.6 | 37.9 | 32.1 | 2.2 | 460.2 | 11.2 | 471.4 |

TABLE 4.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

| Period. | B.o.T. Price Index, 1938 = 100. | | | Iron-ore output. | Imptd. ore used. | Coke sent to blast-furnaces. | Pig-iron, ferro-alloys prod. | Scrap used in steel prod. | Steel (incl. alloy). | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Iron and steel. | Coal.†† | Basic materials§ | | | | | | Imports.† | Prod. ingots, castings. | Delivrs. finished steel. | Stocks.‡ |
| 1959 | 340 | 486 | 477 | 286 | 244 | 210 | 242 | 208 | 7 | 388 | 291 | 2,244 |
| 1960 | 339 | 493 | 482 | 329 | 319 | 264 | 303 | 243 | 24 | 467 | 361 | 2,724 |
| 1960—Oct. | 339 | 508 | 472 | 344 | 332 | 273 | 314 | 256 | 17 | 497 | 385 | 2,625 |
| Nov.* | 339 | 525 | 474 | 344 | 337 | 279 | 315 | 266 | 20 | 505 | 370 | 2,686 |
| Dec. | 339 | 525 | 472 | 325 | 336 | 272 | 306 | 232 | 18 | 451 | 340 | 2,724 |
| 1961—Jan. | 339 | 526 | 471 | 351 | 327 | 272 | 308 | 248 | 14 | 478 | 363 | 2,792 |

* Months contain five weeks, all tables.
† Weekly average of calendar month.
‡ Stocks, ingots, semi-finished and finished steel, at the end of the years and months shown.
†† The index for coal is now based on prices ruling on the last day of each month.
§ Used in non-food manufacturing industries.

# *New Literature*

PUBLICATIONS received include the house magazines, catalogues, booklets, etc., referred to below. Readers wishing to obtain a copy of any of the items are invited to write to the address given, at the same time mentioning IRON AND COAL.

JOHNSON, MATTHEY & COMPANY, LIMITED, 73-83, Hatton Garden, London, E.C.1—A brochure is now available on Mallory resistance welding electrode materials.

FLUIDRIVE ENGINEERING COMPANY, LIMITED, Worton Road, Isleworth (Middx)—"Fluidrive for Automatic Flow Control" is the subject covered in the March issue of Fluidrive News.

MARKHAM & COMPANY, LIMITED, Broad Oak Works, Chesterfield—Four brochures have been issued dealing with pneumatic stowing, low-pressure pneumatic stowing, and crusher stower equipment.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steel Works, Sheffield 9—The March issue of Edgar Allen News contains a selection of contributions on the steel and allied industries in keeping with the traditions of the publication.

W. H. ALLEN, SONS & COMPANY, LIMITED, Bedford—Articles on "A High-efficiency Axial-flow Gas Compressor" and "The Application of High-powered Epicyclic Gearing for Industrial and Marine Use" and other subjects are in the March issue of the Allen Engineering Review.

INSTITUTION OF WORKS MANAGERS, 196, Shaftesbury Avenue, London, W.C.2—Take-over bids continue to hit the headlines. In the March issue of Works Management (2s. 6d.) a member of the institution makes a plea for long-term service agreements. Other contents include a feature on materials handling.

TURNER BROS. ASBESTOS COMPANY, LIMITED, Rochdale—"Welcome to Turners" is the title of an attractive brochure, which, in addition to giving information about how to reach the works and the best times to call, provides the intending visitor with a short history of the company (a member of the Turner & Newall organization) and also tells him just what asbestos really is.

HADFIELDS, LIMITED, East Hecla Works, Sheffield 9—Publication No. 463 is entitled "Fine Steels." Those familiar with alloy steels will appreciate that they present difficult problems in all phases of manufacture, and demand a high degree of technical knowledge and supervision. The production plant described in the new publication has been devised with these problems in view.

EFCO FURNACES, LIMITED, Queens Road, Weybridge (Surrey)—"Production of High-speed Steel Tools," an article by Mr. E. Hague in the February number of the Efco Journal, deals with the production of high-speed steel tools at Henry Rossell & Company, Limited, Sheffield. Mr. H. Knight, manager of the Efco heat treatment division at Burton-on-Trent, writes on "Production Heat Treatment by High-frequency Induction."

CROSSLEY BROS., LIMITED, Openshaw, Manchester 11—The steady replacement of steam by diesel propulsion has been one of the most important developments in the field of tug operation for many years. Crossley Bros. has assisted this development by supplying numerous propulsion units for tugs to owners throughout the world. Crossley Chronicles (No. 216) describes two such tugs intended for service in the port of Liverpool.

GHANA OFFICE (INFORMATION SECTION), 13, Belgrave Square, London, S.W.1—Seventy-nine new industries in less than four years is the proud record of Ghana's expanding programme of industrialization. At Tema, where several of the most recent industries are situated, a new factory turns out thousands of aluminium roofing sheets each day. This foreshadows a giant industry which could emerge from the implementation of the Volta river project. Ghana is rich in bauxite. There is news of Ghana's industrial plans in Ghana Today (Vol. 5, No. 1).

ASHMORE, BENSON, PEASE & COMPANY, LIMITED, Stockton-on-Tees—When a brochure illustrating the blast-furnace plants built by the company was published in 1950, the company declared its intention to issue similar publications at five-yearly intervals to bring the record up to date. The third edition, "Fifty Blast Furnaces," coincides with instructions to build the fiftieth modern plant. And the fiftieth, like the first, is for the Ford Motor Company, Limited. The company has a proud record and the pages of "Fifty Blast Furnaces" do justice to the story to be told.

UNITED STATES STEEL CORPORATION, 525, William Penn Place, Pittsburgh 30, Pa—The name Polaris has now come to mean as much to us as it does to the Americans. Whatever our views on the political aspect of Polaris, we will find an article on the subject of considerable interest. It is in the January-February number of US Steel News. A substantial amount of steel in dozens of different shapes and sizes, chemical composition, and physical properties were supplied to Polaris missile contractors and sub-contractors by basic steel mills and fabricating plants of the US Steel Corporation.

HAWKER SIDDELEY GROUP, LIMITED, 18, St. James's Square, London, S.W.1—With the arrival of the March number of the Hawker Siddeley Technical Journal comes the announcement that it has been decided to cease publication of the journal in its present form. This news, which will be regretted by many, will be softened, however, by the statement that it is intended to present the activities of Hawker Siddeley Aviation, Limited, and Hawker Siddeley Industries, Limited, in two separate magazines. The technological developments taking place within the Hawker Siddeley Group will continue to be fully covered.

STANTON IRONWORKS COMPANY, LIMITED, near Nottingham—"A Straight Furrow" is the caption for the pleasant colour photograph adorning the front cover of the February issue of The Stantonian. It was taken by Mr. B. M. Conway, of the publicity and publications department; with it he won a first prize in the novices' general section of the company's annual photographic competition. "Ironmaking at Stanton" is the subject covered by Mr. E. M. Summers, a director and general manager, iron production, in an interesting article. The remainder of the magazine is lighter in character, but well worthy of perusal.

NATIONAL COAL BOARD, Chancery House, Chancery Lane, London, W.C.2—The (comparatively) new chairman of the NCB is writing a series of monthly messages in Coal Magazine, his subject in the March

issue being "Jobs and Wages." Mr. Robens says that he does not expect his readers always to agree with what he says in the articles and he invites correspondence. He also says: "I shall ask the editor to publish as many of these letters as he can find space for, and I'll try and answer them."

THE MARSHALL ORGANIZATION, Stafford House, Norfolk Street, London, W.C.2—This is the first time we have had an opportunity to peruse Mettle, the house magazine of the Marshall Organization. The front and back covers are spanned by the architects' impression of the new Forth Bridge, which is the subject of an article, "The Road to the Highlands." In an interview, Mr. Arnold Carr, Marshall's chairman, tells of his visit to India and Pakistan and gives some of his impressions of the two countries from the point of view of commercial and industrial development. This is a well-produced publication, the contents of which will appeal to readers interested in the industries covered by the companies in the group.

APPLEBY-FRODINGHAM STEEL COMPANY, Scunthorpe (Lincs)—We have praised before the efforts of those responsible for the production of Appleby-Frodingham News, the contents of which are contributed by members of the company. They certainly make a fine job of it. A note on the contents page states that the magazine is published for the interest of all who belong to the company and their families. There is, nevertheless, much in the pages of this attractive publication to interest those who may never have heard of Appleby-Frodingham or, indeed, have any real interest in the manufacture of steel. Some of the excellent photographs are in colour, which does much to enhance the appearance of the production. The spring issue has just been published.

## *Steel Production in Egypt*

PLANS are being considered, according to a Luxembourg report, for the expansion of Egypt's Helouan steelworks to meet the expected increase in steel consumption. Total rolling capacity in Egypt at present is 390,000 tons per annum, of which 250,000 tons comes from the Helouan works. Imports of rolled products average 150,000 tons per annum.

A total of 540,000 tons of rolled products is thus available, equivalent to 22 kg. per head of population, but *per capita* consumption in the near future is expected to rise to over 50 kg.

Consideration is being given to the construction of a third blast furnace at Helouan and a proportional expansion in steelmaking and rolling capacity, including the installation of a continuous wide strip mill, cold-reduction mill, and tinplate facilities.

### Design, Steel Selection, and Heat Treatment

"Three Keys to Satisfaction," a 77-page revised guide to combining sound design principles, proper selection of steels, and good treatment to achieve optimum economy and material performance is now available from Climax Molybdenum Company, a division of American Metal Climax, Inc., 1270, Avenue of the Americas, New York 20, New York. Separate sections on design, steels, and treatment contain basic information which make it possible for fabricators to increase the endurance limit of properly selected steels fivefold when good heat-treatment practices are applied and to increase the endurance limit of properly selected steels tenfold when both sound design principles and good heat-treatment practices are combined. Copies are available upon request.

## SCIENCE MUSEUM EXHIBITION ON CORROSION

METALLIC corrosion and its prevention is to be the subject of a special exhibition at the Science Museum, South Kensington, London, S.W.7. It will open to the public at noon on Monday next and will continue until April 22. This collection of exhibits relating to corrosion and preventive measures has been assembled by the Corrosion Group of the Society of Chemical Industry to mark the First International Congress on Metallic Corrosion, to be held in London from April 10 to 14 under the presidency of Sir Harry Melville, FRS.

It has been estimated that the yearly cost of corrosion to Great Britain alone is at least £200,000,000. The subject is, therefore, of great national economic importance and of direct interest to the layman.

For this reason, although the exhibition will be of particular interest to delegates to the congress, it has been designed so as to be intelligible and interesting to the non-specialists who form the majority of visitors to the museum. It sets out to answer in simple terms the questions: What is corrosion? How and when does it take place? What can be done to prevent it?

After the opening day the exhibition will be on view to the public during the normal opening times of the Science Museum (10 a.m. to 6 p.m. on weekdays and 2.30 p.m. to 6 p.m. on Sundays).

## Corrosion Paper at Plant Engineers' Conference

AMONG the papers at this year's annual conference of the Institution of Plant Engineers, to be held at Blackpool from April 19 to 21, will be one on "Causes and Prevention of Corrosion" by Dr. K. J. Irvine, deputy research manager of the United Steel Companies, Limited. Another steel industry personality, Mr. T. S. Kilpatrick, a director and general manager of the Steel, Peech & Tozer branch of the United Steel Companies, will be the principal speaker at the conference dinner. This year's meeting will again be open to a limited number of non-members from industrial concerns wishing to nominate senior staff to attend. Full details of the conference may be obtained from Mr. G. J. Lyons, secretary of the institution, at 2, Grosvenor Gardens, London, S.W.1.

### Pipeline Industries Guild

An all-day symposium entitled "Economics of Pipelines," will be held by the Pipeline Industries Guild on April 11, at Caxton Hall, Westminster, London, S.W.1. Three papers will be introduced. The meeting is open to all persons interested in the subject; applications for tickets and the pre-printed papers should be made to the general secretary at 7, Iddesleigh House, Caxton Street, London, S.W.1. The inclusive fee will be £1 1s.

# IME's SUMMER MEETING IN NOTTINGHAM

PROVISIONAL details of the programme for the summer meeting of the Institution of Mining Engineers, to be held in Nottingham on July 19, 20, and 21, have been announced. The general meeting, on July 19, will be in the Great Hall, Trent Building, University of Nottingham. Ir. A. Hellemans, of Staatsmijnen in Limburg, will present a paper on "The Interaction of British and Continental Coal-mining Technique" at the morning session. Following a luncheon for members at the invitation of Becorit (Gt. Britain), Limited, there will be a paper on "The Related Technologies of Coal Production and its Utilization" by Dr. D. T. A. Townend and Mr. R. L. Brown.

The institution dinner, followed by dancing, will be held in the Portland Building of the university in the evening.

On the second day there will be full-day visits for members to Bevercotes and Calverton collieries, the Avenue carbonization and briquetting plant of the National Coal Board, and to W. E. & F. Dobson, Limited. Members and ladies will be able to participate in a full-day visit to the Brush Electrical Engineering Company, Limited, at Loughborough, and in an afternoon visit to Raleigh Industries, Limited. In the evening there will be a reception by the Lord Mayor and the Corporation of Nottingham.

On the final day there will be visits for members to Area No. 6 Central Workshops, NCB, Bestwood, and for members and ladies to T. C. Wallace (1949), Limited (lace factory). Members and ladies will be entertained at luncheon by the East Midlands Divisional Coal Board.

Various other visits for the ladies have been arranged for each day of the meeting. Registration forms, covering both members and ladies, should be returned to Mr. J. McDermid, secretary of the institution, as soon as possible, and in no case later than May 20.

The junior section meeting, arranged by the Midland Counties Institution of Engineers, for students and associates under 30 years of age of any of the federated institutes, will be held at the University of Nottingham on July 17 and 18. Registration forms for this meeting also must be received by Mr. McDermid by May 20.

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**Steel Mill at Chittagong**

The proposed steel mill to be set up at Chittagong, East Pakistan, will initially produce 100,000 tons of steel per year and its construction would require, in the first stage, a sum of about Rs. 110,000,000, according to Mr. Abul Kasem Khan, Industries Minister. The report of the Japanese team on the proposed mill has been received by the Government. A number of Japanese concerns are expected to participate in the building of the plant.

# *America's Largest Dump Truck*

**Its dump bed towering five storeys over the heads of spectators, the "Western 80," America's largest end dump truck, demonstrates its ability to handle loads up to 220 tons in mining service.**

**The 145-ton giant, 16 ft. wide and 55 ft. long, rides on 18 6-ft. high Goodyear tyres designed for hard rock service and containing enough rubber to make 1,000 passenger-car tyres.**

**Sixteen of the tyres support the dump bed, which carries a normal load of 150 tons per trip in service for the Western Contracting Corporation at a Utah copper mine.**

**"Getting the Best Out of Coal"**

A report is now available on the Combustion Engineering Association's conference on "Getting the Best Out of Coal," held at Harrogate last November. Following an opening address by Dr. C. M. Cawley, chief scientist, Ministry of Power, papers by leading authorities in their several subjects examine, from both the technical and economic aspects, the choice of coal allied to the selection, operation, and maintenance of equipment for boiler plants and industrial furnaces and kilns in order to achieve the maximum savings in capital and operating costs. The subsequent discussions are also fully reported in the 205-page report, which can be obtained (price £1, post free) from the offices of the association at 70, Jermyn Street, London, S.W.1.

# COMPOUND SAFETY CONTAINER

DESIGNED and produced to fulfil many requests for a safe and fully insulated compound container for use underground, the Sheen insulated compound container is used in the transport of hot cable jointing compound underground. Melting has to be done on the surface, so that previously the transport of the molten compound underground presented many problems, not the least of which was rapid cooling of material. With this container, however, compound can be melted on the surface in the galvanized inner bucket,

THE SHEEN INSULATED COMPOUND CONTAINER.

which is supplied with a false bottom and close-fitting lid, on a Sheen portable furnace.

The molten compound is then placed in the insulated container and fastened securely in position.

The container itself is of lightweight double-skin construction and is insulated both on the sides and lid with a 2-in. thick layer of glass wool, quick-action clamps are provided to hold the lid firmly in position and carrying handles are provided.

It is felt that this equipment helps to solve the problem of transporting molten compound over fairly long distances underground. The container has been thoroughly tested under all conditions and is at the moment being used in the east Midlands, Wales, and Scotland.

The manufacturers, Sheen (Nottingham), Limited, also make a fully-comprehensive range of furnaces, both gas and paraffin, and cable jointing equipment and accessories of all types.

# *Book Review*

**Coal Tar Fuels (Second Edition).** Association of Tar Distillers, 9, Harley Street, London, W.1. 21s.

COMPILED by the Technical Committee of the Association of Tar Distillers, the second edition of "Coal Tar Fuels" makes a valuable contribution to the study of fuel efficiency. Coal tar fuels, derived from British coals, and with a low sulphur content and a high flame emissivity, have an important part to play in the usage of liquid fuels. In a foreword, Mr. Richard Wood, Minister of Power, points out that throughout the changes in the supply and consumption of fuel since the war, coal tar fuels have both maintained their place and given most useful relief in time of special difficulty.

The authors of this new and wholly rewritten edition are experts in the field of liquid fuels, especially of coal tar fuels. The first chapter describes briefly the production of coal tar in the coal carbonization process, then surveys generally the technique of coal tar distillation to give the valuable products and, finally, shows how the different coal tar fuels are prepared.

Chapter 2 is concerned with the composition and properties of the fuels, and emphasizes particularly the importance of the carbon-hydrogen ratio and low sulphur content. In discussing the viscosity, it is pointed out that the fuels are, in fact, designated according to the temperature at which the fuels reach viscosities suitable for atomization.

The combustion process is considered in chapter 3, showing the theoretical amounts of air required for combustion of coal tar fuels, and the products resulting.

Some interesting information follows on how a study of flame shape and flow patterns can be of practical use in improving furnace processes. Chapter 4 is valuable to chemical engineers concerned with designing the equipment for storing and handling the fuels.

Several new nomograms have been worked out based on practical data.

Many types of burners, pumps, valves, heaters, and other auxiliary plant equipment recommended are described in chapter 5. In the final chapter on "Applications," the suitability of coal tar fuels for open-hearth furnaces and other types of metallurgical plant, and for boiler plant and other purposes is demonstrated. The advantages originating from the low sulphur content and high flame emissivity in the particular use and the influence on fuel efficiency are stressed.

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THE MOST NORTHERLY railway line of its kind in the world, well within the Arctic Circle, has been completed in the USSR between Murmansk and the important nickel-ore deposits at Pechenga. Though only about 100 miles in length, its construction has involved difficult engineering problems. Very little of it is straight, on account of many marshes, rivers, and lakes, and it has 340 bridges and bridge crossings.

# PARIS CONFERENCE ON "TIN-BASE BEARINGS"

GENERAL theme of the 10th Journée de l'Etain, held in Paris on March 2, was "Tin-base Bearings," with particular reference to the manufacture of tin-base bearings for larger engineering units. The chairman was Prof. P. Bastien, director of research and professor at l'Ecole Centrale des Arts et Manufactures. The following four papers were presented: "The Choice of a Bearing Metal," by Mr. W. R. Lewis, assistant director of the Tin Research Institute; "The Effect of Preparation and Tinning Procedures on the Adhesion of White Metal Linings to Steel and Cast Iron," by Dr. W. E. Hoare, assistant director of the institute; "The Tinning of Large Bearing Shells in Steel and Cast Iron, and the Application of the Direct Chloride Process at Société des Forges et Ateliers du Creusot," by Monsieur M. G. Charnet, of Société des Forges et Ateliers du Creusot, and "The Use of White Metal Bearings in Engineering Construction and Maintenance," by Monsieur J. Bertrandias, of Ets. Bertrandias, Paris.

Mr. Lewis dealt with the fundamental requirements of bearing alloys in general, discussing in turn oil retaining quality, embeddability for grit and foreign particles, immunity from seizure, fatigue resistance, and dimensional stability. Of all the possible materials, tin-based alloys had proved most successful for all applications, except for the modern very small and extremely highly loaded high-speed backed bearings of motor cars. In the last three or four years even this composition deficiency of tin-based bearings has been overcome by the development of the aluminium-tin bearing alloy containing 20 per cent. of tin. In the general engineering field where it was not necessary to subject bearings to such extreme stresses, the tin-base babbitt alloys continued to dominate the field on the grounds of general suitability and safety under every variety of working conditions.

With a view to facilitating the selection of the right tin-base bearing, and in the interest of standardization, the British Standards Institution had recently published for the first time specifications covering the nine bearing alloys, ranging in tin content from 90 per cent. downwards and including two in which lead was the predominant metal. Practically every engineering requirement could be met from one or other of these recommended alloys.

In his address, Dr. Hoare said that a sound bond was necessary in order to give good thermal conductivity, proper reinforcement of the lining by the shell and, therefore, good resistance to mechanical failure during use. Steel shells could be prepared by normal acid pickling, but cast-iron shells required the use of different procedures in order to overcome the effect of graphite present in the structure of cast iron. The various operations of preparation and tinning were described, and the levels of adhesion obtainable by different procedures were indicated.

The preparation, tinning, and lining of large bearing shells for heavy-duty machinery should be a well-planned and well-controlled metallurgical operation. Laboratory investigations had resulted in the development of preferred procedures, and modern engineering plants were making increasing use of these new and improved techniques.

## *New Furnace for* EXFOLIATION OF VERMICULITE

NEW furnace for the exfoliation of vermiculite—almost in the portable class—has been developed and tested at the Balham (London, S.W.12) research and development unit of Mandoval, Limited, importers of crude vermiculite, a company under the management of the Rio Tinto group. The new furnace provides a working temperature of up to 1,200 deg. C., heat being applied by a Rotovac oil burner to the graded vermiculite particles which flow through the furnace chamber. A special feature is that the design allows optimum heat to be applied equally to all particles.

The chamber is lined with refractory blocks, backed by a space containing loosefill exfoliated vermiculite. The outside floor, walls, and roof of the furnace are made of vermiculite/Ciment Fondu panels.

The new furnace is designed to be mobile within the factory. A smaller furnace is available for on-site exfoliation; a shipping-space saver on oversea contracts as bulk crude vermiculite is one-twelfth the volume, weight for weight, of the exfoliated material.

## Prevention of Eye Injuries in Industry

IN any industry injuries to eyes are more or less common and HM Chief Inspector of Factories' report for 1959 lists nearly 7,000 eye injuries of different types and degrees of severity. Eye injuries are not one of the major hazards of the steelfounding industry, but in view of the seriousness of the possible consequences of even apparently trivial eye injuries, the Safety Committee of the British Steel Founders' Association has been conducting a campaign to reduce accidents to eyes. This campaign has been supported in the steelfoundries by posters and pamphlets for operatives and the committee has now produced a film emphasizing the need for the continuous use of goggles, eye shields, etc., the importance of obtaining skilled treatment for any eye injury, and the possible consequences of neglecting these precautions.

The film, entitled "Your Eyes are Precious," is a 16-mm. sound and colour film running for approximately 8 min. and deals particularly with situations which may arise in steelfoundries. Its general theme, however, is one which can be applied to any industry and the BSFA Safety Committee has, therefore, arranged for copies to be available on loan to any interested organization on request to the association at Broomgrove Lodge, 13, Broomgrove Road, Sheffield 10. Copies of the film may also be purchased at a cost of £15 per copy

# *Forthcoming Events*

MARCH 27

*Institution of Production Engineers (Manchester Section)*:—Annual general meeting at the Manchester College of Science and Technology at 6.30 p.m., followed by "Electrified Railway Freight Handling Systems," by G. R. Higgs.

MARCH 28

*Combustion Engineering Association (North Western Region)*:—Meeting at the Bull and Royal Hotel, Fishergate, Preston, at 7.15 p.m. "Industry and the Clean Air Act," by Dr. J. S. G. Burnett, medical officer of health, Preston.

*South Staffordshire and Warwickshire Institute of Mining Engineers*:—Meeting at the Swan Hotel, Lichfield. "Ball Clay Mining in South Devon," by C. L. Booth, HM District Inspector of Mines and Quarries, and W. J. Bloor, manager, Watts, Blake, Bearne & Company, Limited.

*Institution of Mechanical Engineers (South Wales Branch)*:—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6 p.m. "The Diesel Engine in Association with the Gas Turbine," by E. Chatterton.

*Institute of Marine Engineers (North East Coast Section)*:—Meeting at Stephenson Building, King's College, Claremont Road, Newcastle-upon-Tyne, at 6.15 p.m. "Materials for Advanced Steam Conditions and Their Influence on Operation of Turbines and Boilers," by Cdr. H. E. C. Hims and S. H. Frederick

*Society of Chemical Industry (Corrosion Group)*:—Visit to Alcan Industries, Limited, at noon; visit to Aluminium Laboratories, Limited, at 2.30 p.m.; meeting at the Crown Hotel, Banbury, at 4 p.m. "The Resistance of Aluminium to Supply Waters," by Dr. H. P. Godard, and "Behaviour of Aluminium in Modern Power Station Condensate Water," by Dr. E. A. G. Croom and D. Hastings.

*Institution of Plant Engineers (Glasgow Branch)*:—Meeting at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, C.2, at 7.15 p.m. "Recent Developments in Handling and Firing of Domestic and Industrial Boiler Plants," by R. Clelland, regional fuel technologist, National Coal Board.

*Institution of Plant Engineers (South Wales Branch)*:—Annual general meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6.30 p.m., followed, at 7.30 p.m., by "Some Engineering Problems with Chemical Plant," by J. C. Veale.

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MARCH 29

*Combustion Engineering Association*:—Meeting at the Criterion Restaurant, Piccadilly Circus, London, W.1, at 2.15 p.m. "Modern Developments in Water Tube Boiler Design," by Dr.-Ing. Heinrich Vorkauf.

*Institution of Mechanical Engineers*:—Meeting at 1, Birdcage Walk, Westminster, London, S.W.1, at 6 p.m. "An Experimental Study of the Flow Conditions and Pressure Drop of Steam-water Mixtures at High Pressures in Heated and Unheated Tubes," by R. W. Haywood, C. A. Knights, C. E. Middleton, and J. R. S. Thom.

*North East Coast Institution of Engineers and Shipbuilders (Teesside Branch)*:—Meeting at the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 6 p.m. "Marine Steam Turbine Design and Operation," by A. F. Veitch.

*Society of Instrument Technology (South Wales Section)*:—Annual general meeting at the Welsh College of Advanced Technology, Cardiff, at 6.45 p.m., followed by "Feedback," by R. S. Medlock.

*Institution of Mechanical Engineers*:—Meeting at 1, Birdcage Walk, London, S.W.1, at 3.30 p.m. "An Experimental Study of the Flow Conditions and Pressure Drop of Steam-water Mixtures at High Pressures in Heated and Unheated Tubes," by R. W. Haywood, G. A. Knights, G. E. Middleton, and J. R. S. Thom.

MARCH 30

*Institution of Mechanical Engineers (Eastern Branch)*:—Meeting at the Diocesan Hall, Ipswich, at 7.30 p.m. "Common and Uncommon Causes of Failure of Plant in Service," by G. A. Cottell.

*Institution of Mechanical Engineers (East Midlands Branch)*:—Meeting at the Technical College, Lincoln, at 7.15 p.m. "Powder Metallurgy Applications," by R. H. Swan.

*Institution of Plant Engineers (Sheffield and District Branch)*:—Meeting at the Grand Hotel, Sheffield, at 7.30 p.m. "The Role of the Central Engineering Workshop in the Maintenance Problem," by G. C. Oram (Appleby-Frodingham Steel Company).

APRIL 3

*Society of Instrument Technology (South Yorkshire Section)*:—Annual general meeting at the University, St. George's Square, Sheffield 1, at 7 p.m., followed by "Feedback in Management Control," by M. Thomas.

## National Association of Colliery Managers

APRIL 3

*South Midland Branch*:—Annual general meeting and presidential address at Ashby Rescue Station, at 4 p.m.

APRIL 4

*South Wales Branch*:—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6 p.m. "Hydraulic Face Supports—Experience in No. 4 Area, East Midlands Division," by C. Round, No. 9 Area general manager.

APRIL 5

*Scottish Branch*:—Meeting in the Mining Laboratories, Grassmarket, Edinburgh, at 5.15 p.m. Address by D. J. Skidmore, production director, Scottish Divisional Coal Board.

APRIL 7

*Midland Branch*:—Annual dinner and dance at the Sherwood Rooms, Greyfriar Gate, Nottingham.

APRIL 11

*Yorkshire Branch*:—Annual general meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m.

APRIL 17

*Midland Branch*:—Meeting at the Five Ways Hotel, Nottingham, at 6.30 p.m. Address by H. S. Stephenson, HM Divisional Inspector of Mines

APRIL 21

*Kent Branch*:—Annual general meeting at the Swan Hotel, Deal, at 7.15 p.m., followed by "The Reconstruction of Snowdown Colliery," by J. L. Huxley, agent/manager, Snowdown Colliery.

APRIL 26

*Lancashire Branch*:—Meeting at 40, Portland Street, Manchester. "The Application of Fluid Drives in the Mining Industry," by E. C. Farrer, director, Fluidrive Engineering Company, Limited.

APRIL 27

*South Staffordshire, Warwickshire, Worcestershire and Shropshire Branch*:—Visit to Bretby Central Engineering Establishment.

APRIL 28

*Kent Branch*:—Annual dinner and dance at the County Hotel, Canterbury.

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## Royal Society's Endowed Prizes

The Royal Society of Arts, as trustee for the undermentioned endowments, offers the following prizes during the year 1961:—The Howard Prize of £50 for mechanical motive power and the Fothergill Prize of £20 for fire prevention or fire-fighting. The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and a prize of £50 will be awarded to the author of a treatise on some aspect of the subject of motive agents. Under the Fothergill Trust (established by the will of Dr. Fothergill in 1821) a prize of £20 is offered for a descriptive essay or model embodying some new idea for the prevention or suppression of fire.

# IRON AND STEEL TRADE

SPECIFICATIONS for steel deliveries during the latter part of the second quarter are now coming forward more freely. This can be regarded as an indication that the large stocks held by consumers and merchants at the end of the year—nearly 4,500,000 tons according to the official estimate—have now been reduced to something more approaching normal. While the demand for universal beams is maintained, improvement has been shown in orders for medium plate and there is a greater call for heavy sections, beams, and joists.

### Pig-iron

Production of pig-iron is maintained at substantial levels and is now running at an annual rate of between 15,000,000 and 16,000,000 tons. Basic pig-iron forms the larger percentage of output and, generally, is being fully absorbed by the steelworks. Foundry grades of pig-iron are also being produced in adequate quantities and deliveries could be increased if the call warranted.

There is not a great deal of day-to-day change in the demand for the high phosphorus irons, more of which could be readily supplied, but the substantial outputs of the low phosphorus irons are being taken up to a greater extent, now that the car industry is coming out of its recession period.

### Ferro-alloys

There has been a further reduction in the price of ferro-tungsten, which now stands at 9s. 11d. per lb., W. contained tungsten metal powder being reduced to 12s. 11d. per lb. There is an interesting call on supplies of ferro-silicon and silicon metal, and ferro-chrome is active. Moderate support is given to silico-manganese and ferro-manganese.

The demand for ferro-titanium and ferro-niobium is steady and reasonable attention is given to ferro-vanadium, and ferro-molybdenum.

### Semi-finished Steel

The re-rollers report that arrears of work on hand for small bars and light sections have now been almost overcome and there is not sufficient business being placed at the moment to restore order-books to their former congested state. Demand is improving for strip and bright drawn bars and reinforcing rods and bars continue to be quickly taken up.

There are plenty of steel semis in stock so that the re-rollers are not ordering, presumably allowing stocks to diminish to more practicable levels. The situation is not so easy, however, for carbon and alloy steel billets.

### Finished Steel

Colliery requirements are still well below capacity and a much larger number of indents for arches, pit-props, benk bars, and light rails, either for current or forward delivery, would not come amiss. The situation for black sheets and hot rolled strip is slightly better, but here again further tonnage would be welcomed by the producers.

With new plant being gradually run in to operate at near capacity, producers of plate are beginning to see the wood for the trees so far as clearing the back-log of orders is concerned and rolling dates have been shortened for many of the more popular thicknesses. There is no change in the position regarding small angle flats, rounds, etc., and orders are being accepted for reasonable delivery.

## *Ore Chartering*

ALTHOUGH from certain of the major areas some slight increases in rates have been reported, there is no real improvement which could be credited to the world markets as a whole. Marmagoa/Continent reports the payment of 50s. f.i.o. for 10,500 tons 5 per cent. for late March loading, and a similar size has been fixed to Japan at 48s. f.i.o., same position, and a 10,000-tonner has been taken to West Italy at 45s. f.i.o. and trimmed for middle April shipment. From the Black Sea, Poti to south France recently fixed 4,000 tons at 29s. f.i.o. for March shipment. The Mediterranean trades are very quiet and little business is available for the large carriers, particularly for prompt loadings. No ore fixtures have recently been reported from north Africa to the Continent.

West African ore shows a little more inquiry for April and a small cargo of manganese from Takoradi has been fixed to Amsterdam and Hamburg at 42s. 6d. f.i.o. and trimmed for about 4,200-4,500 tons, April/May. In the phosphate section, Safi to Szczecin reports 22s. for 9,500 tons in March. Generally speaking the phosphate trade from Casablanca to the UK is quiet. There are one or two inquiries but charterers are certainly not pressing and should have no difficulty in covering their requirements. Vassiliko Bay/Rotterdam recently paid 26s. for 4,400 tons of pyrites, spot shipment, but here again, from Huelva either to the UK or the Continent little is available.

## Steel Company of Wales at Leipzig Spring Fair

PERSONAL contact as a preliminary to doing business in Eastern Europe was urged by Mr. Peter d'Subin, of the Newport Division, Steel Company of Wales, Limited, at the Leipzig Spring Fair. SCOW was exhibiting for the first time at the fair, although business with East Germany has been going on for several years.

Mr. d'Subin said: "To do anything in the East European market, you have got to be there and go on being there." East Germany and other East European countries were comparatively flexible within their scheme of overall planning, he said. There were sometimes marginal changes in their requirements, and it was necessary to be there to give them what they wanted.

AUSTRIAN COAL-MINING and steel company, Osterreichisch-Alpine Montangesellschaft, of Vienna, is to invest 500,000,000 schilling this year in the expansion of sheet rolling mills at its Donawitz, Kindberg, and Judenburg plants. This is part of a current 1,600,000,000 schilling investment programme.

*Coalfield News*

## Miners Who Have No Birth Certificates

WHEN the National Union of Mineworkers' pension scheme becomes compulsory after April 4 a condition of entry for pit workers will be that they produce their birth certificates—but nearly 160 miners at Michael Colliery, East Wemyss (Fife) have no certificates. They are Polish workers, most of whom fled their country at the time of the German invasion in 1939 leaving behind such personal documents.

Mr. Max Meharry, NUM delegate at the pit, said: "We have explained the problem to the Polish lads at pithead meetings and we are now taking the matter up with the Scottish executive of the union to see what can be done."

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MINERS WELFARE BATHS and hall at Shotts (Lanarkshire), may be forced to close because of its new rating valuation—it has soared from £239 a year to £1,532. Bathsmaster, Mr. David Stewart, said: "We are certainly going to appeal against this new valuation, but if it is not drastically reduced the 'Welfare' will have to shut down."

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AGREEMENT COMPLETED between the Yorkshire Area of the National Association of Colliery Overmen, Deputies, and Shotfirers and the North-Eastern Divisional Coal Board may serve to prevent a recurrence of the sort of dispute which led to a breakaway union being formed in the East Midlands coalfield. The agreement is on a system of conciliation in the case of disputes and has already been agreed in principle on a national basis.

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Other speakers included Mr. T. R. Samson, Divisional safety engineer, Mr. William Duncan, president of the Scottish branch of the National Association of Colliery Managers, Mr. William McKibbon, National Association of Colliery Overmen, Deputies, and Shotfirers, Mr. Kilday, manager of Benhar Colliery, and Mr. W. Moore, NUM branch delegate, Northfield Colliery.

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Highest individual awards went to W. Barrass (Ellington), A. Ferguson (Longhirst), and F. Ward (Bedlington "D"). Ashington and Ellington Colliery teams will go forward to the national NCB finals in Blackpool in April. Trophies were presented by Mr. T. Holliday, president of the Northumberland Area of the NUM.

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# THE COAL TRADE

WITH a drop in temperature of 49 deg. in just over three days in the south of England and three inches of snow in the Midlands and the north, any merchant who had already settled back to a warm-weather spell of relaxation has been rudely awakened. The spell of activity for the trade may be short-lived, but it has served to show that stocks have not yet been accumulated in sufficient quantity to provide for just such a vagary of the English climate.

### SCOTLAND

**Glasgow**—Divisional output remains stubbornly around 350,000 tons a week, a standard which is sufficient for current needs, but given bad weather it could be well below par having regard to the comparatively small margin of reserves. The undistributed stock at the collieries is little over 100,000 tons in contrast with about 10 times that figure a year ago. Sub-normal throughputs at power stations have enabled the electricity authorities to restore their reserves. Over 100,000 tons brought up from the North of England coupled with the mild weather enabled them to add 79,000 tons to stock, bringing the total to 301,000 tons.

Despatches ceased at the beginning of the month, and programmed tonnages from divisional sources will be adequate until end April. In the meantime estimates for the next 12 months are under review and new programmes will be drawn up.

Except for coking smalls, consumption of industrial sorts is below that of a year ago. This is not due to any slackening in industrial activity, but is a reflection of reduced space-heating requirements. In spite of this fact the current level of output leaves little margin between supply and demand, and the undistributed stock total continues to decline. Many merchants' disposals of house coal have remained surprisingly high, but some of the smaller one-man firms have cancelled orders. Demand is spread over all grades, and no particular difficulty has arisen with regard to the top groups, even at current charges. Demand for doubles has slackened a little, but this fuel has now its established devotees. Anthracite nuts are busier again, and until the promised increase in supplies from Wales becomes available the position can only be relieved by people taking advantage of the alternative fuels recommended by appliance manufacturers. Metallurgical coke demand is sustained at a high level, but supplies are well maintained.

**Fife and Lothians**—Pressure on supplies in both zones has eased slightly, but trade by and large is comfortably balanced. Exports over a period are lower than last year.

## *Remarkable Response to Plan for "Export Assistance Register"*

RESULTS of the Institute of Director's questionnaire to its 36,000 members on setting up an Export Assistance Register were announced on Tuesday. More than 600 British exporting firms, including many of the biggest in the country, have offered to give general advice and help to non-competing firms wanting to export. A total of 523 have said they would welcome this kind of advice. Work is now in hand "marrying up" the names of the firms.

Mr. Roger Marlow, secretary of the institute's Export Action Now Committee, said that the response was remarkable and heartening. "We hope that the register will provide a unique service in the export drive."

## Drain on Coal Stocks Eases

TOTAL output of saleable coal last week rose by over 200,000 tons to 3,962,600 tons, about 200,000 tons above the average for the year so far. Undistributed stocks are dwindling less rapidly but by March 11 had dropped to 23,541,000 tons, nearly 10,000,000 tons less than a year ago.

Although exports and bunkers showed a slight increase to 104,000 tons, coal consumption for the week ended March 11 had eased off from 4,296,000 tons to 4,059,000 tons, 300,000 tons above production.

There were 580,730 wage-earners on colliery books on March 11, against 620,040 on March 12, 1960, the numbers engaged at the coal face being 218,180 and 237,620 respectively. Total absenteeism (all workers) in the week ended March 11 was 15.90 per cent., compared with 15.23 per cent. in the week ended March 12, 1960. Output at the face was 4.094 tons and overall 1.416 tons in the week ended March 11, compared with 3.995 and 1.419 tons in the week ended March 12.

The following table gives (in tons) the revised output of saleable mined coal by division in the week ended March 18, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

| Division. | Week ended March 18, 1961. | | Week ended March 19, 1960 |
|---|---|---|---|
| | Total output. | Tonnage lost. | Total output. |
| Scottish .. | 360,000 | 5,000 | 370,000 |
| Northern (N&C) .. | 245,000 | — | 246,000 |
| Durham .. | 467,000 | — | 475,000 |
| North-Eastern .. | 831,000 | 4,000 | 850,000 |
| North-Western .. | 245,000 | 1,000 | 283,000 |
| East Midlands .. | 903,000 | 1,000 | 927,000 |
| West Midlands .. | 284,000 | — | 305,000 |
| South-Western .. | 377,000 | 10,000 | 415,000 |
| South-Eastern .. | 30,000 | — | 31,000 |
| Great Britain— | | | |
| Deep-mined coal .. | 3,742,000 | 21,000 | 3,902,000 |
| Other deep-mined (including licensed mines) .. | 42,000 | — | 55,000 |
| Open-cast coal .. | 179,000 | — | 170,000 |
| TOTAL .. .. | 3,963,000 | 21,000 | 4,127,000 |

BOILER PLANT order worth £19,000,000 for a large power station to be built at West Burton (Notts) has been placed with International Combustion, Limited, by the Central Electricity Generating Board. The order covers the supply and erection of four large water-tube boilers with assisted circulation and designed for advanced steam conditions. The capacity of each boiler is sufficient to serve one 500,000 kW turbo-alternator. The contract is the largest single order ever placed with the company.

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WITH a drop in temperature of 49 deg. in just over three days in the south of England and three inches of snow in the Midlands and the north, any merchant who had already settled back to a warm-weather spell of relaxation has been rudely awakened. The spell of activity for the trade may be short-lived, but it has served to show that stocks have not yet been accumulated in sufficient quantity to provide for just such a vagary of the English climate.

### SCOTLAND

**Glasgow**—Divisional output remains stubbornly around 350,000 tons a week, a standard which is sufficient for current needs, but given bad weather it could be well below par having regard to the comparatively small margin of reserves. The undistributed stock at the collieries is little over 100,000 tons in contrast with about 10 times that figure a year ago. Sub-normal throughputs at power stations have enabled the electricity authorities to restore their reserves. Over 100,000 tons brought up from the North of England coupled with the mild weather enabled them to add 79,000 tons to stock, bringing the total to 301,000 tons.

Despatches ceased at the beginning of the month, and programmed tonnages from divisional sources will be adequate until end April. In the meantime estimates for the next 12 months are under review and new programmes will be drawn up.

Except for coking smalls, consumption of industrial sorts is below that of a year ago. This is not due to any slackening in industrial activity, but is a reflection of reduced space-heating requirements. In spite of this fact the current level of output leaves little margin between supply and demand, and the undistributed stock total continues to decline. Many merchants' disposals of house coal have remained surprisingly high, but some of the smaller one-man firms have cancelled orders. Demand is spread over all grades, and no particular difficulty has arisen with regard to the top groups, even at current charges. Demand for doubles has slackened a little, but this fuel has now its established devotees. Anthracite nuts are busier again, and until the promised increase in supplies from Wales becomes available the position can only be relieved by people taking advantage of the alternative fuels recommended by appliance manufacturers. Metallurgical coke demand is sustained at a high level, but supplies are well maintained.

**Fife and Lothians**—Pressure on supplies in both zones has eased slightly, but trade by and large is comfortably balanced. Exports over a period are lower than last year.

## *Remarkable Response to Plan for "Export Assistance Register"*

RESULTS of the Institute of Director's questionnaire to its 36,000 members on setting up an Export Assistance Register were announced on Tuesday. More than 600 British exporting firms, including many of the biggest in the country, have offered to give general advice and help to non-competing firms wanting to export. A total of 523 have said they would welcome this kind of advice. Work is now in hand "marrying up" the names of the firms.

Mr. Roger Marlow, secretary of the institute's Export Action Now Committee, said that the response was remarkable and heartening. "We hope that the register will provide a unique service in the export drive."

## Drain on Coal Stocks Eases

TOTAL output of saleable coal last week rose by over 200,000 tons to 3,962,600 tons, about 200,000 tons above the average for the year so far. Undistributed stocks are dwindling less rapidly but by March 11 had dropped to 23,541,000 tons, nearly 10,000,000 tons less than a year ago.

Although exports and bunkers showed a slight increase to 104,000 tons, coal consumption for the week ended March 11 had eased off from 4,296,000 tons to 4,059,000 tons, 300,000 tons above production.

There were 580,730 wage-earners on colliery books on March 11, against 620,040 on March 12, 1960, the numbers engaged at the coal face being 218,180 and 237,620 respectively. Total absenteeism (all workers) in the week ended March 11 was 15.90 per cent., compared with 15.23 per cent. in the week ended March 12, 1960. Output at the face was 4.094 tons and overall 1.416 tons in the week ended March 11, compared with 3.995 and 1.419 tons in the week ended March 12.

The following table gives (in tons) the revised output of saleable mined coal by division in the week ended March 18, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

| Division. | Week ended March 18, 1961. | | Week ended March 19, 1960 |
|---|---|---|---|
| | Total output. | Tonnage lost. | Total output. |
| Scottish .. .. | 360,000 | 5,000 | 370,000 |
| Northern (N&C) .. | 245,000 | — | 246,000 |
| Durham .. .. | 467,000 | — | 475,000 |
| North-Eastern .. | 831,000 | 4,000 | 850,000 |
| North-Western .. | 245,000 | 1,000 | 283,000 |
| East Midlands .. | 903,000 | 1,000 | 927,000 |
| West Midlands .. | 284,000 | — | 305,000 |
| South-Western .. | 377,000 | 10,000 | 415,000 |
| South-Eastern .. | 30,000 | — | 31,000 |
| Great Britain— | | | |
| Deep-mined coal .. | 3,742,000 | 21,000 | 3,902,000 |
| Other deep-mined (including licensed mines) .. | 42,000 | — | 55,000 |
| Open-cast coal .. | 179,000 | — | 170,000 |
| TOTAL .. .. | 3,963,000 | 21,000 | 4,127,000 |

BOILER PLANT order worth £19,000,000 for a large power station to be built at West Burton (Notts) has been placed with International Combustion, Limited, by the Central Electricity Generating Board. The order covers the supply and erection of four large water-tube boilers with assisted circulation and designed for advanced steam conditions. The capacity of each boiler is sufficient to serve one 500,000 kW turbo-alternator. The contract is the largest single order ever placed with the company.

*Board Changes*

# New Posts for MI Directors

TWO new appointments have been made by the board of METAL INDUSTRIES, LIMITED. Mr. John Black, the deputy chairman, becomes, in addition, managing director, and Mr. Wilfred Padley becomes deputy managing director. Mr. Black joined Metal Industries as chief accountant in 1951 and was appointed to the board in the following year. He became deputy chairman in 1956.

Mr. Padley joined the group in 1956 and was managing director of Brookhirst Igranic, Limited, Chester, MI's electrical subsidiary, before being appointed to the parent board in 1960.

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HARPER ENGINEERING & ELECTRONICS, LIMITED—Mr. Alfred Neate has been appointed a director.

SPENCER GEARS, LIMITED—Mr. C. H. Spencer and Mr. J. W. L. Schofield have been appointed directors.

BRITISH THERMOSTAT COMPANY, LIMITED—Mr. W. E. Lambourne has been appointed an additional director.

S. SMITH & SONS (ENGLAND), LIMITED—Mr. C. St. C. Proctor has been appointed financial director, and Maj. C. M. Carrington has retired from the board.

SKEFCO BALL BEARING COMPANY, LIMITED—Mr. Inge Stenberg, a director of S.K.F. Aktiebolaget Svenska Kullagerfabricken, the parent company, has been appointed an additional director.

SANDERSON BROS. & NEWBOULD, LIMITED—Mr. H. A. Latham, forge and rolling mill superintendent, has been appointed to the board. He joined the company in 1938 and was appointed to his present post in 1953.

D. NAPIER & SON, LIMITED—Mr. P. J. Daglish, who joined the company, a member of the English Electric Company, Limited, group last year, as a special executive, has been appointed to the board as commercial director.

GEORGE RICHARDS & COMPANY, LIMITED—Mr. J. Carle has been appointed managing director of the company, a member of the Staveley Industries, Limited, group. He holds directorships in a number of other companies in the group.

FINANCE CORPORATION FOR INDUSTRY, LIMITED—Sir Archibald Forbes, chairman of the Iron and Steel Board, and of the Central Mining Investment Corporation, Limited, and a director of English Electric Company, Limited, has been appointed to the board as from April 1.

EXPERT TOOL & CASE HARDENING, COMPANY, LIMITED—Following the company's acquisition by the Northern Mercantile & Investment Corporation, Limited, the board has been reconstituted as follows: Mr. E. J. Routly, chairman; Mr. A. Murray, managing director; Mr. W. G. F. Westbrooke and Mr. J. Campbell.

A. P. V. COMPANY, LIMITED, makers of stainless steel and alloy plant and vessels, of Crawley (Sussex)—The dividend is being raised from the equivalent of 7.1 per cent. to 11¼ per cent. on capital increased by a one-for-five scrip issue, for 1960. Profits expanded from £495,893 to £750,235 and the net group profit balance is up to £350,151 (£243,944).

G.K.N. STEEL COMPANY, LIMITED—Mr. C. F. Pagnamenta has been appointed a director, but will continue to serve as company secretary. Mr. A. T. Harris has been appointed a local director of Brymbo Steel Works, Limited, and Mr. T. Dennison takes up a similar appointment with the Guest Keen Iron & Steel Company, Limited. Both concerns are subsidiaries of G.K.N. Steel.

# "Rebel" Pit Union to Seek Five-day Week

ASSERTING that the National Association of Colliery Overmen, Deputies and Shotfirers was "a dying union," Mr. Ezra Wood, vice-president of the rebel Amalgamated Central Association of Overmen, Deputies, and Shotfirers, said last weekend that NACODS had "outlived its usefulness and neglected its members." At every pit, he suggested, members were to be found who were dissatisfied with its organization, and they were urged to join the new movement.

Speaking at Mansfield (Notts), Mr. Wood said that his movement, which broke away from the official NACODS, would make a stand on the question of a five-day week, with which, he claimed, the official union was not prepared to go forward. A suggestion by Mr. Alfred Robens, chairman of the National Coal Board, that weekend working should be introduced at selected pits would, he maintained, mean the closing down of more pits when the board found it could get the coal elsewhere.

Mr. Thomas Orton denied that members of the new association were rebels, saying: "Having joined an alternative organization we are no longer rebels." In reply to a suggestion that it should rejoin NACODS, he said: "We are being asked to go back to the old corrupt organization that we left. Ours is the only trade union organization in the industry that is free, clean, and unfettered by superstition. It has the universal respect of all the people inside the industry, including the National Union of Mineworkers."

A demand for a 15-minute reduction in the statutory eight-hour shift of colliery winders is to be taken up by the NUM's representatives on the Joint National Negotiating Committee for the industry. This was reported on Saturday to the Nottinghamshire Area Council for the union, which submitted the claim to national level. The district officials are consequently seeking better conditions for the 300 members of the Derbyshire and Nottinghamshire Winding Engine Men's Association, which was expelled by the NUM last year. Mr. Albert Martin, general secretary of the Nottinghamshire Area Council, said that all but a few winding engineers had now lined up with the NUM—some had dual membership previously—because they realized it would be "stupid" to continue with an organization which had no negotiating powers.

## INDUSTRIAL OUTPUT STEADY IN JANUARY

INDUSTRIAL production increased by less than 1 per cent. in January, according to figures issued by the Treasury on Tuesday. The Index of Industrial Production was 120 in January (1954=100) compared with 119 in November and 120 in January, 1960. As production normally recovers in January after the Christmas holidays the adjusted index, which eliminates such seasonal factors, was 119 for January (the same as for January, 1960), compared with 120 in December.

The Treasury's figures confirm that, since April last year, the level of industrial output has remained virtually unchanged. The January index of 119 compares with an average of 120 in the fourth quarter of last year and of 121 in the third quarter.

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WOLF ELECTRIC TOOLS, LIMITED—Mr. J. O. Bovill has been appointed managing director of the associated company, Wolf Sales, Pty., Limited, near Sydney, New South Wales.

*Company News*

# Doxford-Sunderland Merger Terms Announced

TERMS were announced on Monday of the merger foreshadowed early in January between William Doxford & Sons, Limited, shipbuilders and engineers, of Sunderland, and the Sunderland Shipbuilding Dry Docks & Engineering Company, Limited. Doxford is to offer five of its £1 ordinary shares for every six Sunderland £1 shares. Based on Monday's price of 84s. for Doxford units, the exchange offer is worth a total of £5,250,000.

The Sunderland directors intend to accept in respect of their individual holdings, and to recommend the offer to shareholders. The question of extending the proposals to cover the existing preference capital of Sunderland is being examined. Upon the merger becoming effective there will be a change in name of the Doxford company and a number of the Sunderland directors will join the Doxford board.

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BRITISH OXYGEN COMPANY, LIMITED—An extraordinary meeting is to be held in May to create capital and effect a one-for-two scrip issue.

FEDERATED FOUNDRIES, LIMITED—Profits for 1960 have risen by 34.9 per cent. to £439,174 (£325,431) and the dividend is increased to 20 (17½) per cent.

BRUCE PEEBLES & COMPANY, LIMITED—A loss of £149,658 in 1960 against a previous profit of £46,896 is reported, and no dividend is recommended on the ordinary shares against 10 per cent. for 1959.

HALESOWEN STEEL COMPANY, LIMITED—A final dividend of 9 per cent. is announced, making a total for 1960 of 13 (11¼ equivalent) per cent. After tax of £54,500 (£40,100), the net profit of £50,820 compares with £40,313.

OPPERMAN GEARS (HOLDINGS), LIMITED—Dividend for 1960 is raised by 2½ per cent. to 17½ per cent. Group net profits rose from £37,505 to £47,381 after tax of £35,833 (£29,500).

A. F. BULGIN & COMPANY, LIMITED manufacturers of precision electronic components, of Barking (Essex)—The dividend is effectively raised by 3½ per cent. to 40 per cent. for the year to January 31, 1961, on capital increased by a one-for-two scrip issue in "A" ordinary.

ENGINEERING COMPONENTS, LIMITED, Slough (Bucks)—The final dividend is 12½ per cent., as forecast, on capital increased by a one-for-two rights issue. The interim on the old capital was 7½ per cent. (1959 total, 20 per cent.). The group profit is up to £383,540 (£335,471).

EXPERT TOOL & CASE HARDENING COMPANY, LIMITED—The offer by Northern Mercantile & Investment Corporation, Limited, to acquire the ordinary shares has been accepted in respect of over 84 per cent. of the shares. The offer has been declared unconditional and remains open for further acceptances.

A. A. JONES & SHIPMAN, LIMITED, machine and small tool manufacturers, of Leicester—A second interim of 27½ per cent., in lieu of a final dividend, makes a total of 35 (30) per cent. for 1960. A one-for-one scrip issue is proposed. Trading profit expanded from £287,862 to £424,653 and net profit to £195,421 (£126,121).

WOLF ELECTRIC TOOLS, LIMITED—Group profit for 1960 increased to £308,181 (£277,326) before tax of £148,419 (£140,000), and the dividend is to be stepped up to 13¾ (12½) per cent. It is proposed to make a one-for-eight rights issue, the proceeds of which will be utilized in financing the purchase of the factory adjoining the company's main premises at Ealing.

HALL-THERMOTANK, LIMITED—The board is to close down Thermotank (Canada), Limited, the chairman, Mr. J. F. E. d'A. Willis, said at the annual meeting on Wednesday. As regards Thermotank Inc., of the US, and J. & E. Hall (Canada), Limited, neither company had yet turned the corner, but their expected losses during the year would be considerably less than last year, he said.

SKEFCO BALL BEARING COMPANY, LIMITED—Net profit increased from £829,749 to £1,004,007 for 1960, after tax of £1,451,000 (£1,271,550). A final dividend of 9½ per cent. is announced, making a 12 per cent. total dividend, compared with the previous equivalent, adjusting for a scrip issue and including a 1½ per cent. jubilee bonus paid out of surplus in tax account, of 10¾ per cent.

HARPER ENGINEERING & ELECTRONICS, LIMITED—Directors report that preliminary group figures for the half year to December 31, 1960, show that sales in the main engineering sections are higher than in the corresponding previous half year, and that profits are well maintained. Indications for the second half year are described as encouraging with order-books, in the main, up to full productive capacity.

A. & S. HENRY & COMPANY, LIMITED—The chairman, Mr. Frank Stockdale, states that results are considered satisfactory in a difficult year of trading and in view of the cash position and group reserves, stockholders are entitled to a substantial portion of the year's earnings. The final dividend of 20 per cent., makes 27½ per cent. for the year—an increase of 2½ per cent. Trading profit dropped by £44,000 to £854,567.

GENERAL ELECTRIC COMPANY, LIMITED—With the formal offer for the capital of Radio & Allied (Holdings), Limited, it is stated that the profit for the year to March 31, 1961, will be "significantly less" than was expected at the time of the interim. Nevertheless, the board feels justified in its intention to pay a second interim of 7 per cent. to repeat 10 per cent. for 1960-61, and expects to maintain 10 per cent. on the capital as increased by the offer.

G. & J. WEIR HOLDINGS, LIMITED, Glasgow—Remaining shares not already held by the company in Weir-Catton, Limited, are to be acquired. Weir-Catton is a holding company with two operating subsidiaries, Catton & Company, Limited, Leeds, and Weir Foundries, Limited, Leeds, which manufacture carbon, low alloy, and stainless steel castings. The acquisition will facilitate the extensive development programme which the operating companies are now undertaking, it is stated.

DELTA METAL COMPANY, LIMITED—A final dividend of 7½ per cent. for 1960, together with a bonus of 7½ per cent. makes a total payment of 20 (17½) per cent. for the year. The final dividend and bonus are payable on the capital as increased by last July's one-for-eight rights issue and by shares issued against the acquisition of C. H. Edwards, Limited, and Sperryn & Company, Limited, in December. Group profit increased to £3,776,968 (£2,879,879) before tax of £1,893,503 (£1,413,666).

A.E.I.-BIRLEC, LIMITED, furnace manufacturers, of Birmingham—To cover its markets in Australia, New Zealand, and South-east Asia, the company has made an agreement with Major Electric Furnaces Pty., Limited, Melbourne, Australia, to create a company to be known as Birlec-Major Pty., Limited, in Australia. The new company will make all types of electric and gas-fired furnaces for heat treatment and melting processes at present built by Birlec and its UK associate companies. Birlec furnaces have pre-

viously been made by Major Electric under licence since 1952.

HESTON AIRCRAFT & ASSOCIATED ENGINEERS, LIMITED, Hounslow (Middx)—Sales of the group's own products continue to encourage, but profit margins are still low, states Mr. N. J. Watson, chairman. Part of the falling turnover on aircraft has been replaced by product contracts in the wider field of engineering. Liaison has been established with some substantial American organizations in the field of mechanical and materials handling, and it is intended to extend the company's activities in these quarters.

WARNER & COMPANY, LIMITED, refined pig-iron manufacturers, of Cargo Fleet, Middlesbrough—New record trading profit of £181,725 was made in 1960, and a proposed final dividend of 32½ per cent. on the doubled ordinary capital, together with the interim payment of 15 per cent. makes a total distribution of 40 (30 equivalent) per cent. The chairman, Mr. D. O. Sillars, states that production has been well maintained this year, although profits are unlikely to increase in the foreseeable future and increased costs have caused some reduction in profit margins.

## Lansing Bagnall Handling Trucks Agreement with US Company

PRELIMINARY plans for the manufacture and distribution of Lansing Bagnall materials handling trucks in the US have been completed, Mr. V. A. G. Lambert, chairman of Lansing Bagnall, Limited, stated on Monday. The trucks are to be made by Towmotor Corporation, of Cleveland, Ohio, one of the largest American manufacturers of industrial trucks. Under a reciprocal arrangement, Towmotor products will be made at Lansing Bagnall's factory at Basingstoke (Hants), and marketed by Lansing Bagnall in Europe, Africa, and Asia.

Lansing Bagnall products include a wide range of fork lift trucks, reach trucks, pallet, stillage and jack trucks, airport and industrial tractors and trailers, and powered handling aids. Towmotor, with its subsidiary, the Gerlinger Carrier Company, of Dallas, Oregon, whose products are included in the new arrangement, makes engine-powered fork trucks and material carriers with capacities ranging from 1,500 lb. to 60,000 lb.

## *"Crash" Programme Urged for Engineers and Scientists*

OUTPUT of engineers and scientists should be increased threefold in 10 years by a "crash programme" for science education, says a Labour Party pamphlet, "Science and the Future of Britain." The present target for the output of qualified scientists and engineers in 1970 is "quite inadequate," it states. "We should aim to produce as many scientists as our resources of students and teaching staff will permit—that is about 15 per cent. per annum increase in the yearly output, which yields a doubling in seven years and a threefold increase in 10."

The pamphlet was prepared with the assistance of a group of scientists which met for several years under the chairmanship of Mr. Alfred Robens up to the time of his appointment as chairman of the National Coal Board. It recommends that the Minister of Science should be assisted by a full-time scientific and technical planning board which should be the chief instrument to co-ordinate scientific activity. It would largely replace the existing Advisory Council on Scientific Policy.

## *Obituary*

### MR. J. T. RICE

THE death has occurred at the age of 70 of Mr. John Thomas Rice, of Mansfield, formerly assistant production manager for the No. 3 Area, East Midlands Divisional Coal Board. He retired eight months ago, after 56 years' service in the mines. He started work at Creswell Colliery (Notts), and rose to become manager of Mansfield Colliery (Notts). Later he was appointed mining agent to the Bolsover Colliery Company, Limited, joining the NCB on nationalization.

He was a member of the Institute of Mining Engineers and a past president of the Midland Counties Institute of Engineers. With Mr. W. Goodman he held a gold medal for a paper given in 1947 on "The Reorganization of Mansfield Colliery." A keen member of the St. John Ambulance Brigade, he was North Nottinghamshire Area Commissioner. He was made MBE in 1948.

### MR. ARTHUR WADSWORTH

DIVISIONAL sinking engineer of the East Midlands Divisional Coal Board since 1951, Mr. Arthur Wadsworth died last Friday, aged 47. He had been in indifferent health for some years. Mr. Wadsworth, who was a native of Rotherham, started work as a pitboy at Frickley Colliery when he was 14. He went to Nottingham in 1936 as assistant to the consulting engineer for B.A. Collieries, Limited, and served in the last war with the 9th Battalion, Sherwood Foresters.

Before taking up his last appointment, Mr. Wadsworth had been sinking and boring engineer in the Nottingham Area since nationalization and was in charge of the shaft development at Calverton Colliery, the Babbington unit, and Bestwood.

The death has occurred of Dr. CHARLES CRESDEE, medical officer for the Nobel Division of Imperial Chemical Industries, Limited, and former medical officer at the Huddersfield factory of ICI from 1952 to 1958.

Former group engineer of the Easington Group (C) of the South East Durham Area of the Durham Divisional Coal Board, Mr. WALTER JOHNSON has died at the age of 72. Since his retirement seven years ago he had been operating a number of small mines under licence from the NCB.

The death has occurred of MR. GEORGE BURLINSON, former manager of the Digby Colliery Company, Limited, Nottingham, with which he served for most of his career. Mr. Burlinson, who was 76, retired after his firm's amalgamation with the Bestwood Coal & Iron Company, Limited.

Mr. MATTHEW B. BAIRD, retired director of Archibald Baird & Son, Limited, colliery engineers, of Hamilton (Fife), has died aged 78. He served an engineering apprenticeship with the firm, of which his father and grandfather were directors. A director for about 50 years, he retired about three years ago.

Works director of Crypton Equipment, Limited, garage and electrical equipment manufacturers, of Bridgwater (Som), a subsidiary of the Metal Industries, Limited, group, Mr. ROBERT SQUIRE has died at the age of 62. He joined Crypton Equipment as chief engineer when the company was formed in 1935 and was appointed works director in 1946.

# NEWS IN BRIEF

EXACTOR, LIMITED, has moved from Edgware to Sterling Works, Blacknell Lane, Crewkerne (Som). Telephone: Crewkerne 733.

ABOUT 70,000 metric tons of steel is to be exported this year by Formosa, earning about $7,000,000. Last year exports of 45,000 tons of steel earned $4,500,000.

"BEYOND OUR SHORES—Export and Manufacture" is the theme of the 1961 two-day northern conference of the British Institute of Management, which opens on April 6.

BLAST FURNACE of the Sulzau-Werfen ironworks in Austria, the last in Europe to be fired by charcoal, is to be closed in a works modernization scheme and dismantled.

BOARD OF TRADE has been advised to put into effect a new direction exempting any imported ball or roller-bearing up to ½ in. in diameter from bearing on its surface an indication of origin.

OUTPUT PER MANSHIFT at the face at collieries operated by the Nigeria Coal Corporation rose from 25 cwt. in January, 1959, to 33 cwt. in October, 1959, and again to 60 cwt. in October, 1960.

THE Federation of British Rubber and Allied Manufacturers has moved its offices to 19/20, Berners Street, London, W.1. The telephone numbers, MUSeum 2671 and 0268 remain unchanged.

BELGIUM'S STEEL PRODUCTION amounted last month to 590,000 metric tons, compared with 585,000 tons in February, 1960. In January only 124,721 (553,900) tons of steel was produced, the strike having affected output.

INVITATION to send a delegation of three to be guests of the East German Mineworkers' Union for a fortnight from the end of April has been accepted by members of the Nottinghamshire Area Council of the National Union of Mineworkers.

SAAR FIRM of Moeller und Neumann, GmbH, has received orders for two rolling mill units for Japan. These are for a complete refined steel rolling mill for the Aichi Steel Works, Nagoya, and for a girder and rail unit for Yawata Iron and Steel, Tokyo.

MR. HERBERT MORLEY, works manager, Samuel Fox & Company, Limited, Stocksbridge, branch of the United Steel Companies, Limited, Sheffield, presented long-service awards and certificates to 55 employees last week. More than 20 received 50-year-service certificates.

HOUSINGS FOR THE slabbing mills for the Spencer Steelworks of Richard Thomas & Baldwins, Limited, are due to arrive at Newport (Mon), docks on April 24. They are being imported from the US, where they were manufactured by the United Engineering & Foundry Company, Pittsburgh.

TWELVE MEN were injured in an explosion at Parkhead Forge, Glasgow, on Wednesday when a 60-ton casting blew up, six being detained in hospital. The men were standing on scaffolding, working at the casting, when the explosion occurred, and some of them were hurt jumping clear.

NEW DIAMOND drilling division has been formed by Coventry Compressors, Limited, hirers of contractors' plant, of London, S.W.8, to deal exclusively with the problems of penetrating the harder materials used in construction and installation work. Mr. T. K. Jenkins has been appointed manager of the new division.

AMERICAN CONCERN, the Olin Athieson Chemical Corporation, believes that aluminium can be made from ordinary clay as cheaply as from bauxite, the commonly used source of the metal. Dr. W. E. Hanford, the vice-president for research, said that preliminary laboratory work had been encouraging, production costs were competitive, and plans were under way to further evaluate the process.

FLOATING CRANE has lifted the first of two 140-ton castings from the hold of the British coaster Lurcher which sank in the River Mersey in January after a collision. The castings, steel mill housings, were made by the English Steel Corporation, Limited, and machined by Davy United, Limited, for Colvilles, Limited.

DURING 1960, the accident rate at the Gateshead-on-Tyne factory of Huwood Mining Machinery, Limited, reached the lowest figure ever recorded, 2.002 per 100,000 manhours. The figure for the previous year was 2.875. There were only 37 accidents in more than 1,847,000 manhours worked, against 50 in 1,746,000 hours in 1959.

IN OUR REFERENCE to Head Wrightson Processes, Limited, in IRON AND COAL of March 10, it should have been stated that Head Wrightson has associated with the Fluor Products Company, of California, on a programme of research into improved methods of cooling. The name of the American company was incorrectly given.

STANDING COMMITTEE has advised the Board of Trade that imported heat insulating bricks should bear an indication of origin at the time of importation and exposure for sale. The recommendation also covers blocks, tiles of infusorial earths, of diayomaceous earths, of kieselguhr, of siliceous fossil meal or of similar siliceous earth.

ANALYSIS OF PROCEDURES for the settling of disputes in industry has been prepared by the British Employers' Confederation. It was presented for discussion at a meeting with representatives of the TUC yesterday (Thursday). This was the second meeting in the series between the two central bodies on industrial relations in general and unofficial strikes in particular.

THREE-POINT PLAN for reducing factory accidents was outlined by Mr. H. Proctor, consultant surgeon at Birmingham Accident Hospital, speaking at Hanley (Staffs) last week. The three necessary Es were:—Education of the worker; engineering improvements to make machinery safe; and enforcement of the safety laws affecting machinery in factories.

PART OF THE EQUITY of the Leobersdorfer Machinen Apparate und Werkzeug-Fabrik (MAW), of Austria, has been acquired by Atlas Copco, AB, of Stockholm, which has also concluded a licence agreement with the Austrian company. Main objective of the venture is to increase sales to South-east Europe where MAW has already been awarded several substantial contracts.

HONEYWELL CONTROLS, LIMITED, factory at Newhouse Industrial Estate, Motherwell (Lanarkshire), will be closed from mid-day July 14 to July 31, 1961. The Hemel Hempstead plant will close from August 11 to August 28. Sales and service of Honeywell products will still be available as usual from the 10 branch offices in the UK and a small administrative staff will be available at the factories.

BY A NEWLY COMPLETED AGREEMENT British Insulated Callender's Cables, Limited, will act as distributors to the electrical industry in Britain and Northern Ireland of fibre-reinforced resin materials manufactured by Thermotank Plastic Engineering, Limited, Chapel-

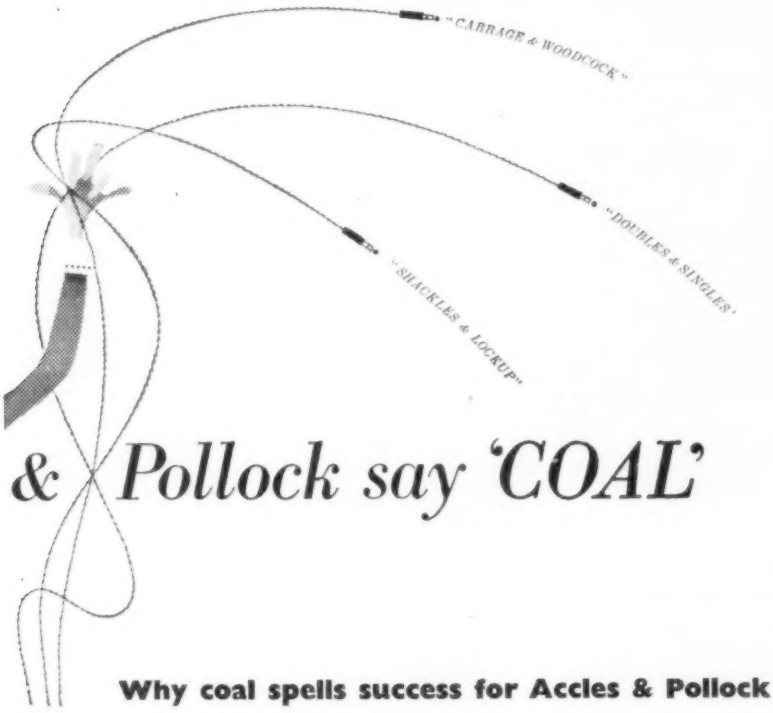
TO CHANGE a lump of stainless steel into a tiny tube .011/.0115″ o/d x .005/.007″ i/d, used for the manufacture of automatic knitting needles in the textile industry, is only one of the many miracles that Accles & Pollock create for science and industry at their works at Oldbury, Birmingham.

Behind this brilliant engineering know-how that will design and produce tubes of any size, any complexity, is the direction and impetus of a dynamic management that secures long-term advantages as well as immediate gain when making decisions. That's why Accles & Pollock choose *coal* to keep their boilerhouse at its efficiency peak. Their experience has proved that coal, mechanically stoked, *gives the maximum heat for the lowest cost;* and they know that there is no shortage of coal —the home produced fuel.

When the question of fuel for your factory is on the agenda, remember Accles and Pollock. Their choice is coal for a progressive and prosperous industry. Even if you get the name wrong, you get the decision right when you follow their example.

***PROGRESSIVE***

*ISSUED BY THE NATIONAL COAL BOARD*




# & Pollock say 'COAL'

## Why coal spells success for Accles & Pollock

Mr. W. E. Powell, fuel engineer, comments: "Our boilers were designed, primarily, for burning the slack grading of solid fuel. Following experiments into ultimate economies, however, it was decided to change to the better fuel of the 'bean' grading. Under test, it was found that solid fuel gave us excellent combustion conditions, at a challenging price per thousand pounds of steam. By making use of modern mechanical means of firing, we are able to maintain strict control of operation practice.

The boilers are of the non-flue type, and when fitted with grit arresters, they satisfy all local and national regulations governing grit and smoke densities.

Most fuels can be controlled to give economical generation on the level obtained by solid fuel, but the use of coal does not entail the provision of ancillary equipment so necessary to the use of other heating mediums.

The present boilers have been in existence some ten to twelve years, and during that period, we have experimented with all available means towards obtaining the best from our equipment. All our tests bring us back to the use of the 'bean' size coal. Given this heating medium, the operators have no difficulty in maintaining the efficiency level nominated by us. That is why we shall continue to use coal at Accles and Pollock."

**And here are some key facts and figures about the Accles & Pollock boilerhouse at Oldbury.**

| | |
|---|---|
| **Number of boilers** | 5 water tube |
| **Method of firing** | Chain grate stoker |
| **Steam pressure** | 120 lbs. per sq. inch. |
| **Steam temperature** | 340°F. |
| **Continuous max. rating** | 72,000 lbs. per hour |
| **Annual fuel consumption** | 20,000 tons of coal |

SOLID FUEL—more heat at less cost—and it's British

***INDUSTRY IS GOING FORWARD ON*** **COAL**

hall (Lanarkshire). The agreement is the outcome of several years of collaboration between the two companies to develop reinforced plastic materials which combine high insulation performance with great tensile strength.

EXCLUSIVE AGREEMENT has been signed by the Birmingham Tool & Gauge Company, Limited, with Madison Industries, of Rhode Island, US, for the manufacture and distribution in the UK of its complete range of special tooling, covering the machining of holes from drilling to super-finishing.

AMONG THE VISITORS to the Stainless Steel Exhibition in London last week was Mr. F. J. Erroll, Minister of State, Board of Trade, who commented on the excellence of the exhibition and said: "It shows the wide range of uses and the versatility of stainless steel in a most comprehensive way." The exhibition is at the Mayfairia Rooms, 32, Bryanston Street, W.1 (Marble Arch) and is open from 10.30 a.m. to 6 p.m. until May 4.

SIX EXPORT MANAGEMENT firms set up a committee in London last week to investigate the advantages of forming an Association of Export Management to provide services to small potential exporters. The association's aim would be to act as a centralized body assisting export management firms to open new accounts with manufacturers, and supply exporters with names of members suited to carry out their particular business.

TRAINING AT university level in industrial relations, collective bargaining, and the problems of industry and the national economy is to be undertaken by senior shop stewards and district committee members of the Amalgamated Engineering Union in the Leeds and Bradford areas. Two courses, which have been arranged in Leeds and Bradford for next winter in conjunction with the extramural department of the University of Leeds, will take the form of 24 weekly evening study periods.

## *In Parliament*

### SOME COAL-MINING STATISTICS

OMNIBUS question on coal production, manpower, and wages statistics was put by MR. CYRIL OSBORNE (Con.). In a written reply MR. JOHN C. GEORGE, Parliamentary Secretary to the Ministry of Power, gave the details in tabular form.

These showed that saleable output rose from 202,300,000 tons in 1950 to 121,200,000 tons in 1952, and dropped to 192,500,000 tons in 1959. The amount paid in wages and salaries rose from £291,000,000 in 1950 to £438,000,000 in 1959 (the peak year was £483,200,000 in 1957); wages and salaries cost per ton was 28s. 10d. in 1950, 46s. 7d. in 1957, and 45s. 7d. in 1959.

Capital expenditure at collieries rose from £24,600,000 in 1950 to £110,400,000 in 1959 and there was an equally steady rise in depreciation cost per ton from 1s. 10d. in 1950 to 4s. 7d. in 1959. The average weekly earnings of underground workers in 1950 was £9 14s. 5d., £15 17s. 7d. in 1957, and £15 13s. 6d. in 1959. The number of persons employed at the end of September each year rose from 711,500 in 1950 to 746,100 in 1952, dropped to 721,100 in 1955, rose to 732,800 in 1957 and then fell to 672,500 in 1959.

ABOUT ONE TENTH of the output of the metal-using industries is now devoted to defence compared with one ninth two years ago, the Minister of Defence told Mr. Wingfield Digby (Con.), in a written reply.

## Price Stability Threatened by "Leapfrog" Pay Awards

WAY in which a wage increase in one major industry is transmitted to others, regardless of their ability to pay, is criticized by the Council of the British Confederation of Employers in its report for 1960. The British Transport Commission is blamed for "encouraging" this trend by its concessions to railwaymen after the Guillebaud report last year. Warning members that the general stability of prices which has been enjoyed for over two years seems now to be "seriously threatened" by rising industrial costs, the report continues: "Once increases have been secured in a few large industries, the general assumption is nowadays made that a pattern has been established to which all industries need to conform if they are not to lose their labour force."

The confederation says that evidence is hard to come by as to the extent to which increases made in one industry draw labour away from another, but argues that "some changes in relative wage rates are an essential part of the process of redistributing industrial resources."

The Minister of Labour, Mr. John Hare, told members of the confederation in Birmingham on Wednesday that it was hoped to publish a booklet soon on redundancy arrangements. It would set down practices which had been found by many employers to work well in dealing with such problems. The booklet, it is understood, will be an edited version of a paper prepared by Ministry officials and presented to employers and union leaders at the last meeting of the Minister's National Joint Advisory Council.

## *New Government Department for Technical Aid Oversea*

CREATION of a new Government Department which will be responsible for the provision of technical assistance, other than capital projects, to oversea countries, was announced by the Prime Minister on Tuesday. A Minister of State will be in charge of the new department, which will be responsible for expenditure in the region of £30,000,000 a year. The main responsibilities of the department will be Britain's contributions to the United Nations Expanded Programme of Technical Assistance and Special Fund, and technical assistance expenditure given bilaterally under such schemes as the Colombo Plan, the Special Commonwealth African Assistance Plan, and others, and for technical and advisory services now carried out by the Colonial Office on behalf of dependent territories.

Up till now, requests for technical assistance have been dealt with through different administrative channels depending on whether they came from one of Britain's independent territories or from an independent Commonwealth country or a foreign country. The new department will meet the need for closer co-ordination.

STEEL INDUSTRY in the US will raise production to at least 60 per cent. of capacity during the second quarter of 1961, and possibly higher, Mr. J. Timberlake, vice-president of the Jones & Laughlin Steel Corporation, forecast on Monday. His company was "experiencing a substantial improvement in orders from almost all sources, except the car industry," he said.

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G26

# New Rating Assessment Will Add £20,000 to Shipyard's Costs

STATING that the rateable value of the company's shipyard had been increased from £2,323 to £20,400, Mr. C. R. Connell, a director of Charles Connell & Company, Limited, engineers and shipbuilders, of Glasgow, said that even assuming that Glasgow's rates were reduced from 26s. 11d. to 23s. in the £1, it would add £20,000 to the firm's annual costs. If, as was proposed, derating was abolished in 1963 the assessment would be doubled to £40,800.

Mr. Connell said that together with an increase in local electricity charges, the shorter working week, the pay increase granted this year, plus the coming rise in the employers' share of National Insurance contributions, the rate increase would add at least £30,000 to the cost of a new tramp's hull. "These local advances are a very serious matter for us, especially when it is remembered that the hull accounts for only 40 per cent. of the total cost of the ship. The propelling machinery and all the other materials obtained from sub-contracting firms in the Glasgow area will also have to bear proportionate increases."

Mr. Connell said that these facts meant that contracts recently taken at fixed prices and with no margin would certainly result in losses.

Other industrial premises in Glasgow which have had heavy increases in rating assessment are those of J. & T. Boyd, Limited, ironfounders (up from £651 to £3,456), and the Rigby Street works of Sir William Arrol & Company, Limited, structural and mechanical engineers (from £2,039 to £9,000).

## *Sharp Rise in Industry's Stocks During 1960*

TOTAL increase in industry's stocks during 1960 was £556,000,000 (at 1954 prices), far greater than the increases in the two previous years and more than twice as great as in 1957, according to the Board of Trade's latest estimates. Provisional figures for the fourth quarter of last year show that the total volume of manufacturers' stocks and work in progress rose by £148,000,000, about 3 per cent., the fourth successive quarterly increase in stocks during 1960, and the largest seasonally adjusted increased in any quarter for which figures are available.

The physical increase in stocks for the whole year, at £457,000,000, was also substantially larger than in any recent year. The figures for the fourth quarter of 1960 are the first to be published in the revised form, with manufacturing industry being assessed on a business unit, rather than an establishment basis.

Figures for capital expenditure in the fourth quarter of 1960 show that this rose in manufacturing industry by 20 per cent., compared with a year earlier. Provisional estimates show that manufacturing industry's total capital expenditure in 1960, at £1,029,000,000 was 18 per cent. higher than in 1959.

GUEST OF HONOUR at the Gauge and Toolmakers' Association luncheon at the Savoy Hotel, London, on April 20, will be Sir Roger Makins, chairman of the UK Atomic Energy Authority. Fifty senior executives and the secretary of the GMTA are to make a group visit to Moscow from May 27 to 31.

## *Census of Production for 1961*

THE Census of Production for 1961, to be taken next year, will be on similar lines to the census now being taken in respect of 1960, and will include firms engaged in mining and quarrying, manufacturing, and construction, states the Board of Trade. Returns will again be required only from a sample of businesses employing 25 or more persons, and not from those already supplying the board with monthly or quarterly figures of stock and capital expenditure.

Questions asked will relate only to sales and work done, capital expenditure, and stocks and work in progress. In the case of the construction industry, information about employment will be sought in place of sales and work done. Firms will also be required to give details of sales direct to the public, such as by mail order, to own employees, etc.

The periodicity of detailed Censuses of Production has been reviewed by the Board of Trade, which has concluded that census operations should be planned on the basis of a five-yearly interval between detailed Censuses of Production and between full and sample Censuses of Distribution. It is intended that the next detailed Census of Production should relate to the year 1963, to be followed by a sample Census of Distribution for 1966 and by a detailed Census of Production for 1968.

## Electrical Manufacturers Call for Consistent Credit Controls

IN its golden jubilee report the British Electrical and Allied Manufacturers' Association blames variations in Government policy for hampering output and exports, despite the electrical industries' record year in 1960. The report says that the Government has been urged to create conditions for stability within the industry by approving and adhering to long-term capital programmes.

The demand for consumer goods was "severely hit by changes in credit control," says the report, whereas all the main sectors of the industry maintained or increased their output. The industry has to spend about £64,000,000 a year on research and development. Expenditure of this magnitude, it is emphasized, can only be supported by large-scale and profitable production programmes.

## *New Furnace Boosts Salzgitter's Iron and Steel Output*

WEST GERMAN iron and steel concern, Hüttenwerk Salzgitter, has raised its anual pig-iron capacity to 1,700,000 metric tons and that of raw steel to 2,000,000 tons by the opening this month of a new blast furnace. The new furnace, with a frame diameter of 7½ m., uses as base material local Salzgitter ores in the form of concentrate sinter.

Using the Salzgitter ultra-acid smelting process, the furnace has a daily capacity of 1,050 tons of basic pig-iron with a consumption of 825 kg. of coke per ton. The furnace, Salzgitter's seventh, replaces the No. 1 furnace which has been closed.

DENMARK IMPORTED about 15 per cent. more iron, steel, and other metals last year, compared with 1959.

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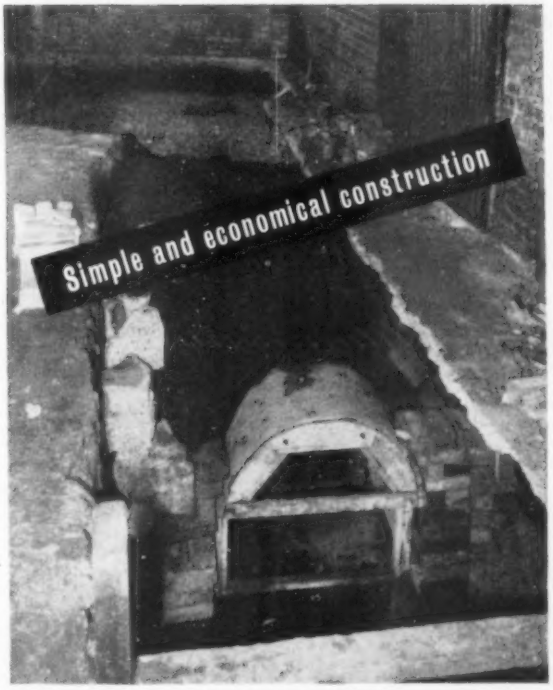


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*Law Cases*

# Allegations of Theft of £66,500 of Steel from SCOW

"FIGURES of this fraudulent scheme . . . amounted to hundreds and hundreds of tons of steel, being stolen, taken away without authority from the premises of the Steel Company of Wales, Limited, and sold to metal merchants. Altogether there was over 1,000 tons of steel involved. Steel is about £45 a ton." Mr. Elwyn Jones, QC, made this submission in opening for the prosecution at Glamorgan Assizes in the case against Richard Hubert Davies (50), a site agent, charged with stealing steel joists and girders from the Port Talbot Works of SCOW and forging and uttering forged repair orders.

Davies pleaded Not Guilty to nine charges of theft and six charges of aiding and abetting Dillwyn John James (37), a lorry driver, in forging and uttering forged repair orders. Mr. Jones alleged that Davies and others together succeeded in organizing "a massive system of stealing steel." James was a lorry driver employed by a subcontractor of SCOW and Davies was the top man for his company at the premises.

The method of dishonesty alleged was that the men exploited the means devised by the Steel Company of Wales for supplying contractors with steel. Contractors would need supplies of steel plate for repairs. They would get it from SCOW by means of a repair order. "The way by which the fraudulent scheme was perpetrated was by complete forgery of repair orders—making completely phoney documents," Mr. Jones said.

Earlier, James had pleaded Guilty to nine charges of stealing steel and six of forging and uttering forged repair orders. In the absence of the jury James was sentenced to 12 months on all charges, to run concurrently.

Mr. Richard Scott Brunton, manager of the maintenance repair shop at the Abbey Works, said he estimated some 1,480 tons of steel, valued at more than £66,500 were involved.

# 18 Months' Prison Sentence on Steel Company Director

ACCUSED of fraudulent conversion of the funds of the Wylie Steel Company, Limited, Keith Douglas Haigh Newarch Beresford Wylie (43), company director, was found Guilty at Leeds Assizes of three of seven charges of fraudulent conversion to which he and his wife, Dawn Wylie, (22), had both pleaded Not Guilty. Wylie was sent to prison for 18 months. His wife was found Not Guilty on all the charges and was discharged.

The jury, at the judge's direction, returned a formal verdict of Not Guilty on an eighth charge alleging fraudulent trading by Wylie and his wife. Wylie was also banned from taking part in the management of a company for five years.

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### WORKERS DID NOT LIKE SAFETY GUARDS

NEWARK sheet metal workers, Blagg & Johnson Limited, was fined a total of £105 at Newark Magistrates' Court for having unfenced dangerous machinery at its works. The firm pleaded Guilty to three cases and were fined £35 in each case.

Mr. D. P. Blatherwick, defending, said the firm was not unmindful of the need for safety, and in fact had spent £1,700 on safety equipment during the last three years. Employees had said that they did not like the guards provided for the machines, and that in some operations they were more of a hazard than a help.

### AGREEMENT REPUDIATED

IRONFOUNDERS and patternmakers, Berry & Dewhirst, Limited, Mirfield (Yorks), was awarded £3,000 damages and costs at Leeds Assizes, against Mr. Leslie George Hemsley, Huddersfield, in an action which arose from negotiations in January, 1959, for the sale of the firm's ironfoundry at Mirfield.

Mr. Justice Havers said that the case for Berry & Dewhirst was that in correspondence between the parties a contract was concluded for the sale of the premises to Hemsley for £7,500. Later, Hemsley, who claimed he had never made an agreement, repudiated the agreement, and the premises were subsequently sold to a third party for £4,500.

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ON 11 CHARGES relating to the theft of £193 9s. 4d. from the Miners' Home Coal Delivery Service, John C. Smith, 48-year-old miner, of Thurcroft, was sent to prison for nine months at Rotherham West Riding Court.

SIXTY-YEAR-OLD former cashier of T. Williams (Drop Forgings & Tools), Limited, Mrs. Florence V. Wadams, was sentenced to three years' imprisonment at Birmingham Assizes, after pleading Guilty to 13 charges of falsification of accounts and eight charges of forgery, involving £30,000. The offences came to light when the company was taken over by Eva, Limited.

AT BIRMINGHAM ASSIZES a former metal cutter, Patrick Joseph Shortland (28), was sent to prison for three years after pleading Guilty to stealing nickel anodes worth £3,617 from his employers, Henry Wiggin & Company, Limited, nickel and nickel alloy manufacturers, of Birmingham. James Thomas Broadhurst (24), coal merchant, who admitted receiving metal worth £2,300 from Shortland, knowing it to be stolen, was sentenced to four years imprisonment.

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## ECSC ENERGY CONSUMPTION FORECAST FOR 1961

TOTAL energy consumption in the European Coal and Steel Community in the current year should be in the region of 478,000,000 metric tons hard coal equivalent, states the High Authority of ECSC. This figure represents a growth of 3 per cent., or 14,000,000 tons over 1960 consumption, and is based on an estimated increase in industrial production of about 6½ per cent., and a rise in the gross national product of 4.7 per cent.

Of the total energy consumption, 239,000,000 tons, or 50 per cent. will be accounted for by hard coal, compared with 52.4 per cent. in 1960, 32,900,000 tons or 6.9 (7.1) per cent. by brown coal, 152,900,000 tons or 32 (29.5) per cent. by mineral oil, 13,800,000 or 2.9 (2.8) per cent. by natural gas and methane, and 39,200,000 or 8.2 (same) per cent. by hydraulic and geothermal power.

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A PARTY of 50 Swedish boys and girls between the ages of 14 and 19, who are the winners in an essay writing competition arranged to promote sales of British coke to Sweden, have won a five-day holiday in Britain as the guests of the British coking and gas industries, and are to arrive in this country on Sunday.

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## University Drops Objections to Coal Workings

AT the public inquiry at Nottingham last week into the East Midlands Divisional Coal Board's application to mine coal beneath part of Nottingham University, Mr. L. H. Spencer, chief surveyor to the No. 6 Area, said that if the application was approved a total of 192,000 tons of coal would be extracted. The board applied to work two deep seams of coal from Wollaton Colliery, one running under private houses, the other extending into a limited area of the University grounds.

Mr. J. C. Leonard, for the board, told a Ministry of Housing and Local Government inspector that the University authorities had objected to the original experimental work under the grounds, which had been going on for the past year, but it had now agreed not to object to the proposed working of the 240-ft. deep seams. The university had wanted to build five new halls of residence on the area of the proposed extraction, but it had told the board that this work would not start until 1972. This would give the board an opportunity to carry out its plans for the almost worked-out Wollaton Colliery, said Mr. Leonard.

The board, he said, had spent a considerable amount of money on improvements to the colliery and wanted to extend its life by at least another year. It also wanted to retain the skilled labour force at Wollaton so that it could be later used at the new Cotgrave Colliery, and to maintain increased production.

Mr. G. Guest, for Nottingham Corporation, said the concern of the authority for the proper development of the university had been met by the arrangements made between the university and the board. After evidence from a number of objectors on behalf of private property affected, the inspector closed the inquiry and visited the site.

## *Improvement in Dutch Coal Market in 1960*

DELIVERIES of hard coal and hard coal briquettes in Holland from all sources rose last year by 5 per cent., compared with the downward trend of previous years. The increase was brought about mainly by a rise in deliveries to coking plants of 10 per cent., although household deliveries also rose—by 3 per cent. —for the first time in several years. Coal imports increased by 5 per cent., while Dutch mined production rose by 4 per cent., being slightly below the rise in sales. With exports more than double those recorded for 1957, pit stocks fell by 200,000 metric tons, or 20 per cent. Production per manshift at the face rose by 8 per cent.

The 1961 national economic plan foresees an increase in inland deliveries by the Dutch hard coal mines of 1 per cent. Deliveries to households are expected to rise by a further 5 per cent., and with a similar production volume, pit stocks should decrease further. The plan states that it is difficult to prophesy whether Dutch coal exports—which last year rose by 20 per cent. as the result of sales to France—will increase by the same degree this year.

WILLIAM BOULTON, LIMITED—Mr. D. Fahey, technical director, has been appointed joint managing director with Mr. E. M. Breeze.

## *Mines Accidents Experts at ILO Meeting*

OPENING the meeting of the International Labour Organization in Geneva where 16 experts from Governments, employers' and workers' organizations have been discussing the prevention of mine disasters, Mr. William Yalden-Thomson, the ILO assistant director-general, recalled that the ILO had been long and actively engaged in efforts to prevent accidents in mines and especially in coal mines. As the result of conferences held since 1945, the ILO had issued a number of codes of practice and other safety publications.

He went on to say that the exchange of information at the meeting would cover many technical aspects of disasters, including their causes and prevention. He expressed the hope that "features will emerge which will give guidance to all countries toward future diminution in mining disasters or a reduction of their severity."

A paper prepared by the ILO for the meeting states that there has been a quickening of interest in accident prevention in recent years, particularly following the underground fire at Marcinelle, in the Charleroi coalfield in 1956, when 262 lives were lost, but, despite this, accident rates in the mining industry throughout the world remain disturbingly high.

## End of Freight Subsidy for German Coal?

PAYMENT by the Federal German Government of 8.6 per cent. of freight rates for coal transported by public-service railways and inland waterways is expected to end next year. The subsidy comes from a tax imposed in West Germany upon fuel oil. Although pit coal prices in the Ruhr are the lowest within the European Coal and Steel Community, freight rates, even taking into account the subsidy, are the highest in the area.

It is now recommended by a Parliamentary committee in Bonn that as from 1962 the results aimed at by the use of the subsidy could be reached more effectively in other ways. A sum of DM 104,000,000, the same as last year, has been put aside for the scheme this year.

## RECORD COAL SHIPMENTS FROM BLYTH

DEMAND for coal from power stations in London and the South has resulted in record tonnages being shipped by British Railways from their three staiths at Blyth (Northumberland). Last year's record of 136,500 tons a week, established in November, has been repeatedly broken. The new peak was reached in the first week in February when 151,400 tons were loaded at the three staiths, providing cargoes for 77 vessels.

The big effort began before Christmas when exceptional demands for electricity, and the after effects of the seamen's strike, combined to create a serious shortage in the South. Shipments have now dropped slightly, but they are still far above average for the time of the year.

AVELING-BARFORD, LIMITED—Mr. A. W. Girling has been appointed director in charge of production.

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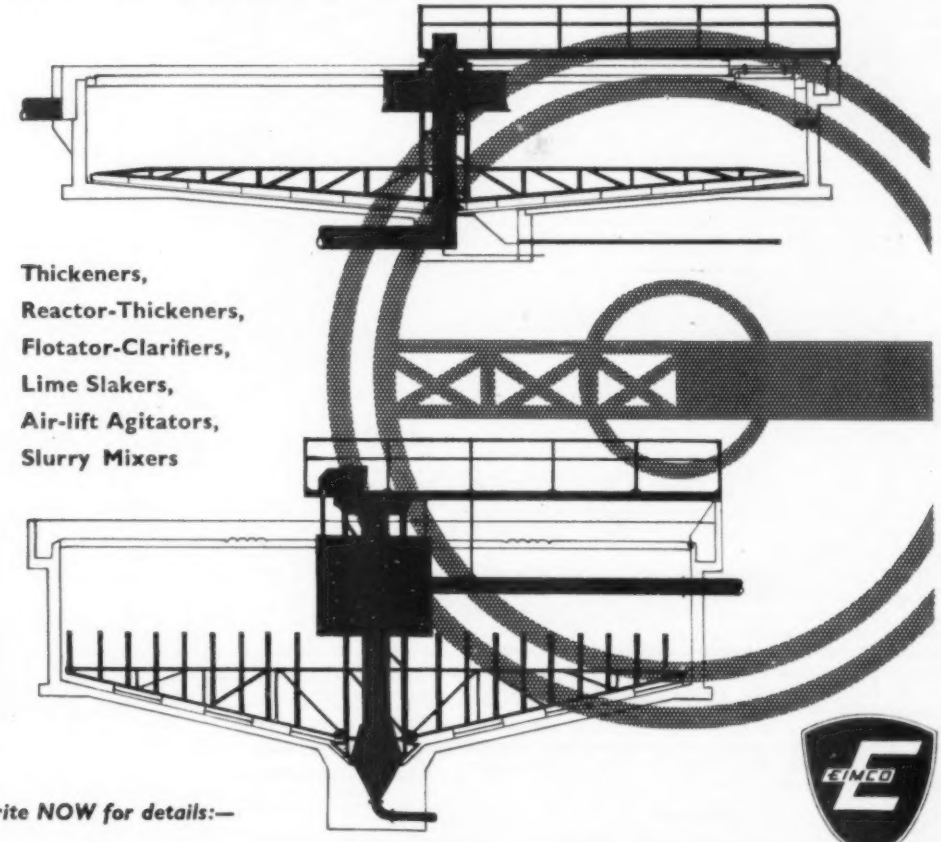

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10

# Technical Books Can Help Export Trade

CHAIRMAN of a three-day "Books for Industry" exhibition which was held last week at the Engineering Centre, Birmingham, Mr. P. J. Edmonds appealed to Midland firms to encourage their chief engineers and technologists to write technical books. The exhibition, organized by the technical and scientific group of the Publishers Association, is the first ever held by the group, which was formed only 18 months ago.

Mr. Edmonds said: "Many firms fail to encourage, and actually discourage, their staff to write books, not realizing that this can be a subtle way of encouraging other British and foreign firms to buy goods. They feel that trade secrets might be given away in the books." He went on: "People do take notice of the names of writers and firms on the title pages and the fact that engineers and scientists from this country were writing the books would help British prestige."

Mr. Edmonds warned that they would have to forget the attitude which treated Britain as a kind of exclusive club, where, if one did not know something, then one was just kept in the dark." This type of thing can lose us valuable export orders, especially in the field of technical writing," he said.

Nearly 40 per cent. of technical books are now exported and last year this amounted to £25,000,000, sold to foreign and Commonwealth countries.

## *Cement Price-fixing Pact Not Against Public Interest*

PRICE-FIXING agreement of the Cement Makers' Federation was declared not contrary to the public interest by the Restrictive Practices Court on Thursday of last week. The President, Mr. Justice Diplock, said the decision was reached in the light of evidence as to the way the agreement had been operated in the past, and because of its confidence in the way the independent costing committee and counsel of the federation, as at present constituted, would continue to operate in the future.

The President said that members of the federation between them produced all but a negligible proportion of the total annual output of some 13,000,000 tons of Portland cement manufactured in the UK. Effective membership of the federation was nine, of which the Associated Portland Cement Company, Limited, group was by far the largest. Voting rights were calculated to reduce the voting power of ACPM to 36 per cent., so that, despite a preponderant position, the group could not control the policy of the federation, although in combination with the Tunnel Portland Cement Company, Limited, group it was able to do so

FULLERS' EARTH UNION, LIMITED, Redhill (Surrey), a member of the Laporte Industries, Limited, group, has concluded an agreement with the Archer-Daniels-Midland Company of New York, to act as sole distributor for sales of "Federal Green Bond" bentonite in the UK. The addition of "Federal Green Bond" to its present range of British-produced "Fulbond" bentonites will enable FEU to supplement its long-established service to the British foundry industries.

## *Increases of Capital*

TUBE FITTINGS, LIMITED, Old Hill (Staffs), increased by £100 in £1 ordinary shares, beyond the registered capital of £25,000.

TRIPLEX FOUNDRY, LIMITED, Tipton (Staffs), increased by £500,000 in 5s. ordinary shares, beyond the registered capital of £275,000.

HARPER ENGINEERING & ELECTRONICS, LIMITED, London, E.C.2, increased by £500,000 in 1s. ordinary shares, beyond the registered capital of £750,000.

THOS. JOHNSON (METAL PRESS WORKERS), LIMITED, Birmingham, increased by £10,000 in £1 "A" ordinary shares, beyond the registered capital of £5,000.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED, London, W.1, increased by £150,000 in 4s. ordinary shares, beyond the registered capital of £650,000.

HARD ALLOYS, LIMITED, metal workers, etc., of High Wycombe (Bucks), increased by £45,000 in £1 ordinary shares, beyond the registered capital of £25,000.

ACROW (ENGINEERS), LIMITED, London, W.2, increased by £55,075 in 5s. non-voting "A" ordinary shares, beyond the registered capital of £1,300,000.

SUTCLIFFE MACHINERY, LIMITED, ironmasters, etc., of Horbury (Yorks), increased by £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

STANMORE ENGINEERING (DIECASTINGS), LIMITED, Stanmore (Middx), increased by £360,000 in £1 ordinary shares, beyond the registered capital of £60,000.

HACKETT BROS. (1934), LIMITED, nut and bolt manufacturers, etc., of Halesowen, increased by £2,500 in £1 ordinary shares, beyond the registered capital of £5,000.

COOKE BROS. (BIRMINGHAM), LIMITED, manufacturers of hinges, pressings, etc., increased by £15,000 in £1 shares, beyond the registered capital of £15,000.

WILLIAM HANKE, LIMITED, engineers and tool makers, etc., of Quarry Bank (Staffs), increased by £5,000 in £1 shares, beyond the registered capital of £5,000.

NORTON INDUSTRIES, LIMITED, founders, engineers, etc., of Wolverhampton, increased by £275,000 in 2s. ordinary shares, beyond the registered capital of £125,000.

HODGE CLEMCO, LIMITED, abrasive blasting machine dealers, etc., of London, E.C.3, increased by £5,000 in £1 ordinary shares, beyond the registered capital of £5,000.

MIDLAND STOCKHOLDERS, LIMITED, iron and steel merchants, etc., of Oldbury (Worcs), increased by £100 in £1 ordinary shares, beyond the registered capital of £5,000.

MIDLAND EXPANDED METAL COMPANY, LIMITED, Wakefield, increased by £71,500 in £1 2nd non-cumulative preference shares, beyond the registered capital of £3,500.

COPE ALLMAN & COMPANY, LIMITED, tube manufacturers, etc., of Bournemouth, increased by £150,000 in 5s. "A" ordinary shares, beyond the registered capital of £350,000.

JAMES WALKER & COMPANY, LIMITED, mechanical engineers, etc., of Woking (Surrey), increased by £50,000 in £1 ordinary shares, beyond the registered capital of £250,000.

BONDED BEARINGS, LIMITED, manufacturers and dealers in bearings, gears, etc., of London, S.W.1, increased by £24,900 in £1 shares, beyond the registered capital of £100.

COLDPOINT DRILLS, LIMITED (formerly Grandplace Engineering Company, Limited, London, S.W.1, increased by £49,900 in £1 ordinary shares, beyond the registered capital of £100.

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T. F. & J. H. BRAINE (HOLDINGS), LIMITED, ironfounders, etc., of Leeds, increased by £120,000 in 5s. "A" non-voting ordinary shares, beyond the registered capital of £300,000.

ROBERTS, SPARROW & COMPANY, LIMITED, steel stockholders and shearers, etc., of Wolverhampton, increased by £100,000 in £1 ordinary shares, beyond the registered capital of £100,000.

BRISTOL PIPING COMPANY, LIMITED, flanged piping and accessories manufacturers, etc., increased by £3,000 in 1s. preferred ordinary shares, beyond the registered capital of £75,050.

TAYLOR & OSBORNE, LIMITED, manufacturers of ferrous and non-ferrous metals, etc., of Birmingham, increased by £20,000 in £1 ordinary shares, beyond the registered capital of £4,000.

CLAVELL BATE & NEPHEWS, LIMITED, packaging machinery manufacturers, etc., of Nelson (Lancs), increased by £12,000 in £1 ordinary shares, beyond the registered capital of £20,000.

KELL & COMPANY, LIMITED, ironfounders, agricultural implement manufacturers, etc., of Gloucester, increased by £12,500 in £1 ordinary shares, beyond the registered capital of £12,500.

GEORGE STOW & COMPANY (OVERSEAS), LIMITED, well drillers, hydraulic and irrigation engineers, etc., of Henley (Oxon), increased by £15,000 in £1 ordinary shares, beyond the registered capital of £10,000.

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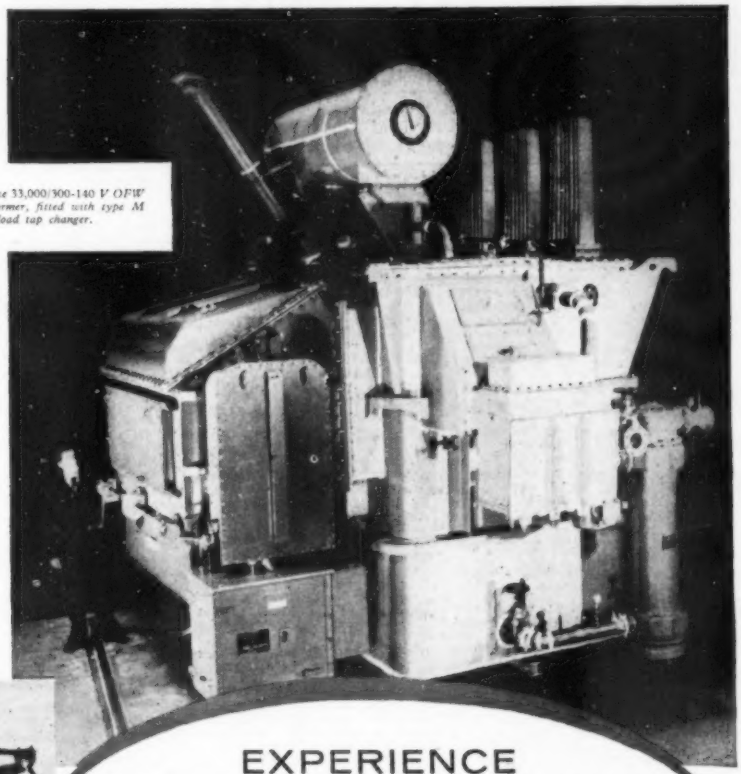
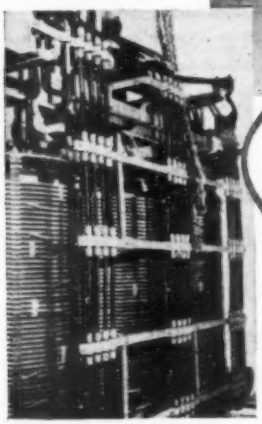


*A 10,000 kVA, 3-phase 33,000/300-140 V OFW cooled furnace transformer, fitted with type M resistor transition on-load tap changer.*

PHOTO BELOW by courtesy of N.V. Ned. Kabelfabrieken, Alblasserdam.



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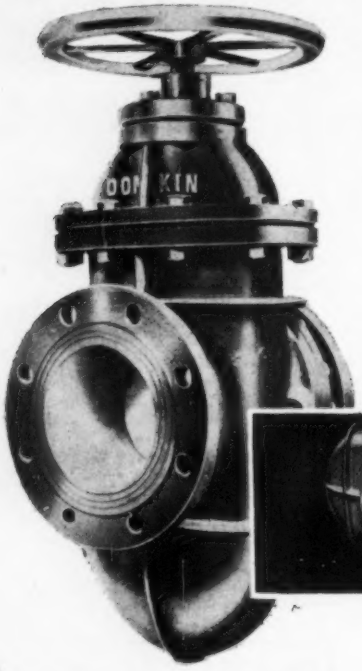

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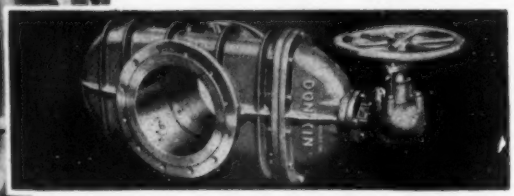

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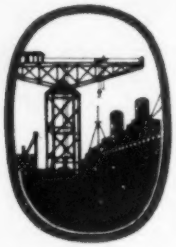

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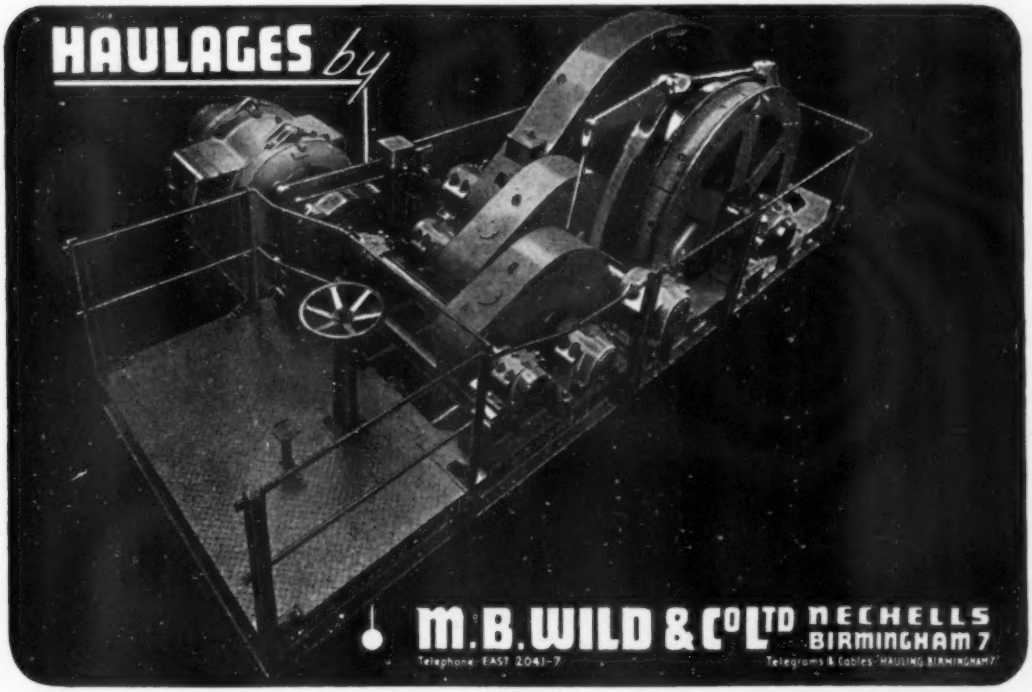

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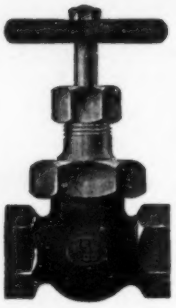

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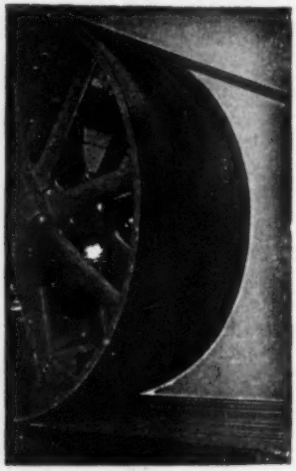

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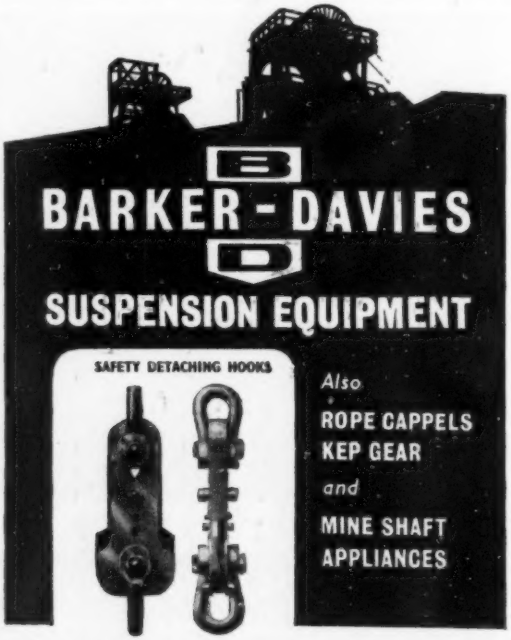

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Fig. 1.

Fig. 2.

Fig 3.

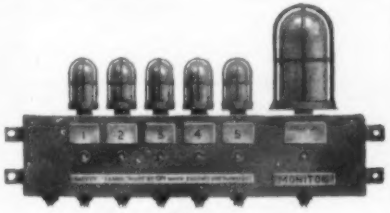


Fig. 4.

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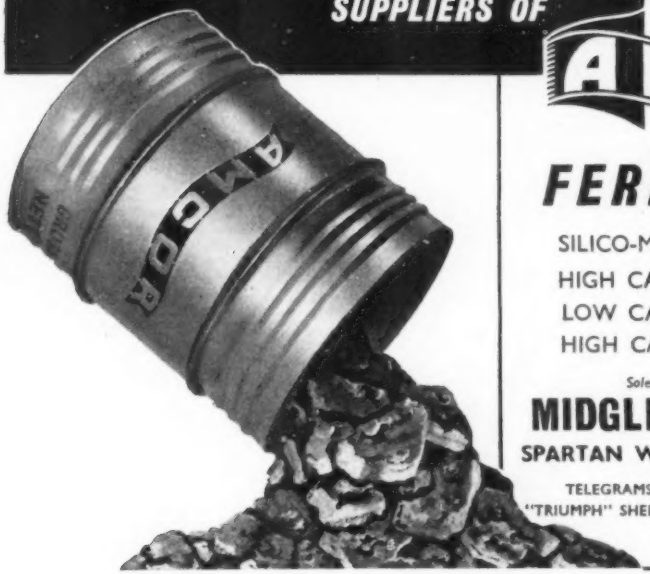


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